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The South Australian Naturalist

The Journal of the Field Naturalists' Section of the Royal
Society of South Australia and of the South Australian
Aquarium Society.

Adelaide



Nov. 1931

Vol. XIII.

No. 1.

CONTENTS.

—:O:—

A Threatening Invader—Ichthyophthirius (By Herbert M. Hale and Clarence F. Blewett)	1-4
South Australian Shells (By Bernard C. Cotton and F. K. Godfrey)	5-23
Wild Flower Show	23-24
Forty-eighth Annual Report of the Field Naturalists' Section	25-26
Balance Sheets	27-28
Report of Microscopic Committee	28

The authors of papers are responsible for the facts recorded and opinions expressed.

Address of the Section: C/o Royal Society's Rooms, Institute Building, North Terrace, Adelaide.

Published Quarterly

Single Copy—NINEPENCE

Obtainable from Cole's Book Arcade, No. 14 Rundle Street,
Adelaide.

Felstead & Omsby, Printers, Delmont's Building, Anster Avenue, Adelaide.

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OUR EXCHANGES.

1. "The Australian Museum Magazine." Sydney. Vol. 4, No. 8.
Among the many interesting articles, there is one on the skates and rays.
2. "The Victorian Naturalist." September, October, and November Nos.
Owners of a copy of the "Census of the Plants of Victoria" will find a detailed supplement (No. 4) bringing its information up-to-date.
3. "The Queensland Naturalist." July No.
4. "The Western Australian Naturalists' Club Monthly" for July, August, September and October.
5. Linnean Society of N.S.W. Abstract of Proceedings for July, August, September and October.
6. "Programme of Activities of the Chicago Academy of Sciences." Illustrated.
Nos. for April and July, 1931.

The South Australian Naturalist.

VOL. XIII.

ADELAIDE, NOVEMBER, 1931.

No. I.

A THREATENING INVADER—*ICHTHYOPHTHIRIUS*.

*By Herbert M. Hale, President, and Clarence F. Blewett, Secretary,
South Australian Aquarium Society.*

It is an aphorism that "big fleas have little fleas upon their backs to bite 'em." Right through nature we find that, as a rule, any one animal is preyed upon by much smaller creatures which are parasitic upon or inside its body. A large number of the higher animals are attacked and sometimes killed by the lowliest of animals—single-celled organisms, or Protozoa.

These minute specks of protoplasm are in most cases not visible to the naked eye, yet various species are responsible for a host of the ills of man.

In 1869 a serious disease of fresh-water fishes was noticed in Germany. It was then shown that the trouble was due to the attacks of an Infusorian called *Ichthyophthirius*—"a destroyer of fish." Never was a parasite so well named! This Protozoan has caused wholesale deaths amongst fishes in Europe; it has been introduced into the fresh waters of North America and has spread rapidly, causing heavy periodic mortality there. It has proved fatal to catfish, sunfish, bass, goldfish, buffalofish, trout, bowfin, carp, tench, bream, crappie, pike perch, pickerel, pike, whitefish, etc., etc.

This undesirable parasite does not occur in our rivers and streams but its introduction therein is a threatening possibility.

The domesticated goldfish, freaks in blue and gold, with over-developed tails and other fins, are perhaps the most popular and showy of fishes for ponds and aquaria. During the past few years these attractive creatures have excited much interest in Adelaide, Melbourne and Sydney. It is a common sight to see an ornamental pond stocked with fancy goldfish in suburban gardens of these cities.

But a fly in the ointment has now appeared. As a rule, the goldfish is a hardy creature, and will live happily for years in an outdoor pond, demanding little attention and at most suffering from easily cured sicknesses. A number of recent purchasers, however, have been disappointed to find that their pets have soon died, and that if they had been placed in a well-stocked

pond all their other fishes died as well. Many cases of this sort have come to our notice during the past year, and an examination in each instance showed that the trouble was due to *Ichthyophthirius*, which is being brought to Australia on imported fishes, particularly on varieties of goldfish which are sold in Adelaide and other cities.

A fish badly attacked by *Ichthyophthirius* rapidly becomes listless and despondent looking, and its fins droop. An examination will disclose the presence of numerous greyish-white spots, each about $1/25$ in. in diameter, on the surface of the body and, in fancy goldfish particularly, on the flowing tail. These however must not be confused with the sex spots on the gill plates and front edge of the pectoral fins of the male goldfish.

If no effective treatment is given, the little attackers increase in number, and eventually cover the whole surface of the unfortunate fish, which, in the last stages of the disease, becomes covered with a heavy slime and red blotches.

Fungus attacks these raw patches, and the fish lives but a short time.

In fighting any sort of parasite we should know something of its life history. The young *Ichthyophthirius* is a minute, free swimming speck, revolving rapidly through the water by means of tiny vibrating hairs or cilia which cover its body. On coming in contact with a fish it burrows into the outer layer of the skin, favoring especially the unscaled portions of the body, such as the gills and the fins.

Once embedded in the skin the little parasite grows rapidly, absorbing its nourishment from the tissues, and very soon is visible as a whitish spot on the outside of the fish. At this stage it may divide by fission several times, forming as many separate individuals. In warm weather the parasite becomes full grown in from two to five days, when it drops off the fish and encysts on the bottom of the aquarium, pond, or river. Here it splits up to form anything from 500 to 2,000 minute young, each capable of carrying on the life cycle as outlined above.

In very cold water the time occupied by the life cycle is greatly extended, and may take two months or more. It will be seen, therefore, that particularly in large bodies of water, the parasite may be present for a long time before it becomes noticeable. But seasonal changes and other factors stimulate its activities and when conditions are suitable the lurking destroyer begins its lethal work. Its effects are most apparent in a pond, where the fish have little chance of escaping infection.

The writers have done some experimental work, and are able to offer a cure which is effective under Australian conditions. This is fairly simple, but must be thorough, it being most wise

to assume that every fish in the collection is diseased. Even though it has not been seen in more than one pool or other receptacle, it may have been introduced into others nearby by hands or net, and not increased in sufficient numbers to be visible on the fish.

Most enthusiasts have one or two large ponds as well as other smaller receptacles such as half casks. The latter form ideal hospital tanks, as the fish can be more closely watched therein. The temperature of the water must not drop below 65 deg. Fahr. If this does occur a longer time must be allowed for treatment. The procedure is simple. Place the affected fish in any large receptacle of water and add 2 per cent. mercurochrome, carefully measured out, in the proportion of eight drops (eight minims) for each gallon of water. Leave the fish in this solution for at least 14 days at a temperature of 65 deg. Fahr. or over, and they will be cured. With this treatment the fish will appear to be free from the parasites in a day or two, but do not trust to appearances; if removed too soon the trouble will recur.

If the infected fish have been maintained in a pond it will be necessary thoroughly to disinfect this also. Mercurochrome treatment for a pool containing perhaps hundreds of gallons would prove expensive, but if this is not done the pond must be drained, all plants and sand thrown out, and the pool scrubbed out with hot water and salt; preferably it should then be allowed to dry out before refilling and replanting.

Future epidemics may be avoided by keeping all newly acquired fishes in quarantine, or, better still, by treating all imported purchases with mercurochrome. The latter, if used in the proportions mentioned, will not harm goldfish in any way, but, in fact, acts as a tonic to them, killing bacteria and other harmful organisms, even if the fish are not carrying *Ichthyophthirius*.

The importance of keeping this Protozoan from our rivers cannot be over-emphasised. We already have a quota of introduced pests which embarrass us in all directions, and yet fresh water fishes carrying a parasite which might easily cause fatal epidemics amongst our own river fishes may be brought freely into Australia without quarantine or competent inspection.

A noteworthy feature in connection with the parasite is that it becomes more active when introduced into South Australian water. Mr. Tee, of the Adelaide Hospital, has recently shown that the water from our rivers and reservoirs is alkaline (Ph8) and offers ideal conditions for the rapid progation of *Ichthyophthirius*. Introduced fish suffering slightly from attacks of the parasite, therefore, become rapidly smothered with cysts when placed in local ponds.

Persons with sick fish are earnestly requested to keep waste water from their ponds away from the sewage system. Fishes such as the scaleless Australian minnow (*Galaxias attenuatus*) breed in the sea and the young find their way up our rivers; such a species could quite conceivably quickly carry the parasite from the river flats to the uttermost limits of its tributaries.

The European Perch, which occurs so commonly in our reservoirs, is apparently not affected by *Ichthyophthirius*, but the Brown Trout is susceptible to its attacks. Rigorous inspection of trout before introduction to our waters is a necessary precaution.

If *Ichthyophthirius* did find its way into our rivers there would be small chance of eradicating it. We do not know how many species of our native fishes may be affected. Let's not risk the experiment!

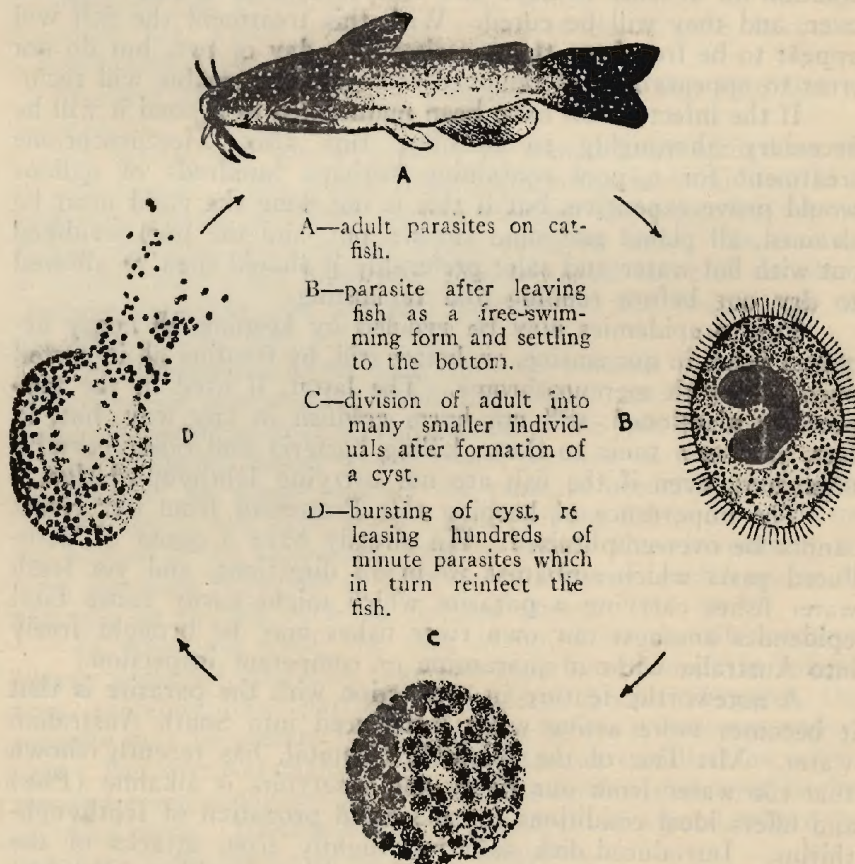


Fig. 1—Life cycle of the parasite (after Prytherch, Bur. of Fish, Washington, Doc., No. 959).

SOUTH AUSTRALIAN SHELLS.

(Including description of new genera and species.)

By BERNARD C. COTTON and F. K. GODFREY.

PART II.

SCALIDAE.

"Wentle-trap shells." Elongate, pyramidal, rather thin, turreted; usually white, polished; longitudinal ribs, often continuous across the suture; spire tall; whorls numerous, convex, in contact or separated; suture deep; mouth rounded, peristome entire, thickened, reflected; umbilicus frequently covered by an expansion of the inner lip. Operculum horny, few-whorled, nucleus nearly central. Distribution—Cosmopolitan, shallow water to 400 fathoms; about 200 species are known. Fossil—Trias; about 200 fossil species have been described. The animals are predaceous and closely related to *Janthinae* (Violet-snails) of which they may be regarded as creeping representatives.

SCALA Humphrey 1797. Whorls a little separated; axial ribs regular, lamelliform; umbilicated. Type—*Turbo scalaris* Linne (= *S. pretiosa* Linne).

S. ACANTHOPLEURA Verco 1906. Pl. 1, fig. 2. Small, broad, white; axial ribs numerous, 30 on the body whorl, carrying a few tubercles or prickles, also axial lines crossed by very a few tubercles or prickles; axial lines crossed by very minute close spiral lirae. Adult whorls eight, convex; mouth round, effuse at base; columella slightly twisted and toothed. Height 4.1, diam. 2.6 mm. Cape Jaffa to Neptune Islands, 90-104 fathoms.

S. FRIABILIS Sowerby 1844. Medium size; white; axial riblets extremely numerous, thin, projecting at an acute angle close to the suture; whorls eight, convex; mouth large; inner lip somewhat thickened internally. Height 22, diam. 7.5 mm. Backstairs Passage to Porpoise Head. 12-20 fathoms.

S. NEPEANENSIS Gatliff 1906. Minute, broad; white, semi-translucent; axial ribs, numerous, erect, about 16 on penultimate whorl, crossed by many spiral threads; protoconch, $1\frac{1}{2}$ smooth whorls, adult whorls $3\frac{1}{2}$, convex; suture impressed; umbilicus small. Height 1.5 mm. diam. .85 mm. One example in dredge siftings.

S. PLATYPLEURA Verco 1906. Pl. 1, fig. 1. Minute, rather solid, broad; axial ribs solid, rather low, double flanged with a free edge projecting on either side, 15 on body whorl; protoconch, whorls two, smooth, convex; adult whorls 8, convex; suture deep; mouth squarish with an oblique gutter at base of columella. Height 5 mm., diam. 2.3 mm. Cape Jaffa to St. Francis Island.

S. RUBROLINEATA Sowerby 1847. Thin, yellowish-white, two banded with light chestnut, the upper band narrower and fainter, sometimes obsolete; axial lamellae numerous, erect, thin; whorls 5, well rounded. Height 26 mm. diam.; 11.5 mm. Normanville to Bunbury. Distinguished by its width.

CLATHRUS Oken 1815. Moderately thick, whorle united; longitudinal ribs numerous, aperture suboval, umbilicus covered by the inner lip, no basal rib. Type—*Scalaria communis* Lamarck.

C. ACULEATUS Sowerby 1844. (*Scala*). Pl. 1; fig. 3. White, shining; axial ribs, about 9 on last whorl, prominent oblique, reflexed, continuous over the whorls and sutures; spire 3 times the height of the mouth; whorls about 9, convex; base convex; suture very deep; outer lip thickened, slightly effuse at base. Height 23, diam. 9 mm. Not uncommon. Grange to 35 miles S.W. of Neptune Islands, 104 fathoms.

C. JUKESIANA Forbes 1852 (*Scala*). Rather small; translucent white, shining; axial ribs numerous, prominent, thin, slightly reflexed, about 20 on last whorl; protoconch of 3 whorls, slightly convex, smooth; adult whorls 11, convex; suture rather deep. Height 19.5, diam. 7 mm. Common. Beach shell-sand. Distinguished from *C. aculeatus* by its very fine and much more numerous axial ribs.

C. PHILIPPINARUM Sowerby 1844. (*Scalaria*). Rather small; white, sometimes fulvous between the ribs; axial ribs, prominent sharp, lamellose, angularly produced above, continuous over whorls and suture, about 10 on last whorl, continued over base; spire sharply conic, about twice the height of the aperture; whorls about 8, convex; suture very deep. Height 11 diam. 2.5 mm. One specimen, Hardwicke Bay.

OPALIA H. & A. Adams 1853. Whorls united, the last with a conspicuous spiral ridge round the base. No umbilicus. Type—*Scalaria australis* Lamarck.

O. AUSTRALIS Lamarck 1822 (*Scalaria*). Pl. 1; fig. 4. Medium size, rather thick; opaque white; axial ribs, stout, very straight; 10 on last whorl terminating in a keel; whorls 9, convex; base concave; suture moderately deep; mouth oval. Height 33; diam., 11 mm. Common. Middleton to Yallingup, W.A. A shallow water species; not taken in dredge.

PROPESCALA gen. nov. Whorls united, the last with a conspicuous spiral ridge round the base; no umbilicus; validly spirally sculptured over the whole surface, though this sculpture may be obsolete on the tops of the axial ribs. Type—*Scala translucida* Gatliff.

P. TRANSLUCIDA Gatliff 1906 (*Scala valida* Verco 1906). Pl. 1; fig. 5. Minute, fairly solid, rather broad; white, semi-translucent; 3 faint spiral light-brown bands; axial ribs prominent, round, about 18 on body-whorl, terminating at the periphery, crossed by numerous spiral lirae; protoconch of about 2 whorls, submammillate, smooth at first, then developing axial riblets followed by spiral striations; adult whorls 9, convex; body-whorl with a bold peripheral rib; base somewhat concave; suture deep. Height 6.4, diam. 2.3 mm. Backstairs Passage, deep water. Most like *Parascala minutula* Tate & May.

PARASCALA gen. nov. Protoconch, a small hemispheric tip and a relatively wide three to four carinated whorl; axial ribs, slender, oblique whorls flatly convex, last with an acute margin defining the base; outer lip thin. Type—*Acrilla minutula* Tate & May.

P. MINUTULA Tate & May 1900 (*Acrilla*). Pl. 1; fig. 6. Minute, turreted, pale yellow-brown, apex white; about 15 axial ribs on penultimate whorl; adult whorls 5, flatly convex, angulated in the early whorls; base smooth; suture linear. Height 2, diam. .57 mm. Beach, Gulf St. Vincent, Fowler's Bay.

CIRSOTREMA Morch 1852. Solid, turreted; whorls cancellated, with a few irregular thick, varices; mouth bordered by a thick crenulated varix. Type—*Scala varicosa* Lamarck. Philippine Islands.

C. MORCHI Angas 1871. Small, narrow; whitish; axial ribs numerous, cancellated by more numerous spiral ribs of equal strength; adult whorls 9, convex; suture impressed. Height 10; diam. 2.5 mm. Deep water, St. Vincent and Spencer Gulf, also S.W. of Neptune Islands. Very variable.

C. CRASSILABRUM Sowerby 1844 (*Scala*). Small, turreted; yellowish-white; ribs rather obsolete; whorls 7, subangular, shouldered; suture deep. Height 13; diam. 4 mm. One example dredged in deep water, Gulf St. Vincent.

C. INVALIDA Verco 1906 (*Scala*). Pl. 1, fig. 7. Small, narrow; translucent white; very crowded, fine, axial and spiral lirae; varices 3, at irregular intervals; deep in suture are several tubercles on upper border of each whorl; adult whorls 8, convex; mouth rounded, flattened by the base of the body-whorl. Height 10.4, diam. 3 mm. Deep water, Gulf St. Vincent.

GRANULISCALEA Boury 1909. Thick; whorls in close contact; axial ribs almost obsolete; last whorl with an indistinct peripheral rib, base convex. Type—*Scala granulosa* Quoy and Gaimard 1834 (*S. granulosa* Quoy & Gaimard).

G. GRANOSA Quoy & Gaimard 1834 (*Scala granulosa* Quoy & Gaimard). Pl. 1, fig. 8. From *Opalia australis*, somewhat stouter; white, shining; ribs hardly discernible; whorls more in contact base convex. Height 30, diam. 12 mm. Fairly common. Alive in crevices of rocks. Guichen Bay to Pt. Wilunga. Often mistaken for a worn specimen of *Opalia australis*.

CYMATIIDAE.

Solid, sometimes large, ovate; varices prominent, rounded, continuous or irregularly disposed, but never more than two to a whorl; sculpture consists of spiral ribs, often nodular, strong, sometimes crossed by axial nodular ribs; periostracum sometimes thick, hairy, bristly; spire elongated; protoconch of about four whorls, horny or calcareous; adult whorls numerous, angular or rounded, sometimes shouldered; base convex, excavated around the canal; suture deep; mouth oval, often excavated above by a deep channel, anterior canal of variable length, not closed, often recurved; outer lip thickened exteriorly, denticulate inside; columella generally plicate; operculum horny, with an apical or submarginal nucleus. Distribution—Mostly tropical, from low water to moderate depths. Fossil—Cretaceous; numerous species occur in the Tertiary. The larvae are free swimming or pelagic and some species, in consequence, have a wide distribution. These are very different at first from the adult both in animal and shell, undergoing a metamorphosis at a period subsequent to hatching. The "Triton Shells" of the tropics are members of this family.

CHARONIA Gistel 1848. Large, elongated, broad; spire prominent; protoconch smooth, glossy, rounded; body whorl large, rounded, with a strong varix at about two-thirds of a turn from the labial varix; mouth oval, channelled above, where a tooth-like prominence borders the channel; basal canal short, truncated, recurved; columella excavated, slightly twisted below. Operculum, thick, horny. Type—*Murex tritonis* Linne.

C. RUBICUNDA Perry 1811 (*Cymatium lampas* Linne). Pl. 1, fig. 10. Large, spindle-shaped; yellowish-brown, with dark-brown and white narrow bands; mouth white, teeth of the outer lip reddish brown, inner lip light brown, the plications white; sculpture of strongly nodular spiral ribs, 2 on the spire-whorls, 8 prominent spirals on the body whorl, and numerous finer and closer ones on the lower half of the base; shoulder with a number of strong spiral ridges, not very nodulous; finely spirally striate between the strong, spiral ridges; spire conical, a little higher than the mouth; protoconch, pinkish, semi-transparent; adult whorls shouldered; suture deep, wavy; outer lip expanded, with an outer varix, inside with long and strong teeth, sometimes in groups of 2 or 3; inner lip polished, spreading widely upon the body whorl; sometimes an umbilical chink is present. Height 190, diam. 114 mm. Uncommon. Kangaroo Island, Spencer Gulf to Western Australia.

C. EUCLIA Hedley. From *C. rubicunda*, this shell is more elongate, narrower, colour similar, sculpture stronger, spire more elevated. Appears to be the southern representative of *Cymatium variegatum* (*Triton tritonis*), which has ribs without nodules. Height 220 mm.; diam. 110 mm. Kangaroo Island, Thistle Island, to Western Australia.

CYMATIUM Bolten 1798. Whorls angular, coronated; mouth longer than the spire; outer lip dentated internally. Operculum with apical nucleus. Type—*Murex femorale* Linne.

C. WATERHOUSEI Adams & Angas 1864. Pl. 1; fig. 11. Medium size, spindle-shaped; yellowish-brown, the incised spiral lines chestnut, mouth white; spiral ribs in pairs, prominent, regularly nodose, with spiral striae between them, the whole ornament passing over and crenulating the much elevated varices which are distant from each other about two-thirds of a revolution; the whole sculpture crossed by numerous rounded axial riblets; periostracum horny, spirally regularly striate, with short bristles; spire conical, scarcely as high as the mouth; protoconch globose, white, shining; adult whorls rather flatly shouldered; base concave; suture deep, undulating; mouth oval; base canal short,

open, slightly recurved; outer lip broad, flattened denticulated by the spiral keels; inner lip thin, white, smooth, with a small rounded tooth above; towards base the lip is drawn out leaving an umbilical perforation. Height 107, diam. 58 mm. Not uncommon. On rocky ledges below low water mark, Beachport to St. Francis Island and Western Australia.

C. SPENGLERI Chemnitz 1795. From *C. waterhousei* this shell is much larger, has not such a scaly, hairy periostracum, the expanded outer lip is rather sharp and deeply denticulated by the spirals, and the inner lip is not so smooth. Height 101 mm., diam. 56 mm. This may prove to be the deep water form of *C. waterhousei*.

C. EXARATUM Reeve 1844. From *C. waterhousei*, this shell is slightly smaller and more nodulous, more heavily spirally ribbed, also spirally striated between the shoulders; there are no axial riblets; varices quite as prominent; whorls very flatly shouldered; base more excavated around the neck; varix of outer lip broad; basal canal longer. Whitish, banded with brown, or brown with a white median band. Height 47 mm., diam. 25 mm. Not uncommon. Robe to Western Australia.

CYMATONA Iredale 1929. The very long oblique canal is characteristic. Type—*Fusitriton kamyllum* Watson.

C. KAMPYLA Watson 1886 (*Fusitriton*). Pl. 1, fig. 9. Small, thin, spindle-shaped; spiral bands yellow-brown, varices remain white; axial riblets, rather narrow, numerous; spiral ribs more pronounced, few, sharp, on early whorls, broad and feebly raised about 6, on larger whorls; varices at about two-thirds of a revolution, forming tubercles at intersection of spirals; periostracum pale chestnut, thin; spire high; protoconch blunt and round; whorls strongly shouldered; basal canal long, narrow, sinistrally bent and reverted. Operculum thin, ovate with apical nucleus. Height 31 mm., diam. 16 mm. Beachport to Robe, from 90 to 300 fathoms.

GONDWANULA Finlay 1926. Ovate; slightly nodulous; varices slightly more than half a turn, not very prominent, flattish; spiral ridges numerous, low, rounded; periostracum thin, wrinkled, velvety; spire rather short, less than the mouth; protoconch small, conical, mostly corroded; last whorl very large, convex; base slightly excavated at the neck; suture not deep; mouth oval with a strong, thick, broad tooth above; canal short, widely open, recurved; outer lip expanded; sharp, denticulate, grooved inside and with a row of paired teeth; inner lip spread thinly over the last whorl. Type—*Ranella tumida* Dunker.

G. TUMIDA Dunker 1862. Large, solid; whitish, with reddish-brown spiral ridges, sometimes with a brown median thread; mouth white; periostracum greenish-brown; spiral ridges prominent about 4 on spire whorls, spiral striae fine, close, numerous, crossed by numerous axial riblets, forming small tubercles. Height 50 mm., diam. 31 mm. Uncommon. Middleton.

G. BASSI Angas 1869 (*Argobuccinum*). Small, medium; pale purplish-brown, the nodules here and there whitish, sometimes interrupted on the wider ridges with small chestnut spots; columella white; mouth interior violet; spiral ridges, close, narrow, flattened, beaded especially towards the base with small nodules; varices, rounded, about 5; outer lip thickened, white, closely and strongly dentated within, columella curved, with a rather prominent tooth at the upper part, and tooth ridged below; canal short, slightly recurved. Height 42 mm., diam. 26 mm. Not common. Beachport to St. Francis Island.

G. FRATERCULUS Dunker. Pl. 1, fig. 12. Pear-shaped; dull white; spiral threads, numerous; slightly crenulated near the sutures and nodulous at the periphery; spire somewhat elevated; protoconch smooth; adult whorls $4\frac{1}{2}$, angulated medially and flatly convex above; large whorl ventricose below the periphery; outer lip smooth within; columella covered with a thin callus, regularly concave; base gradually contracted into a moderately elongated snout, nearly as long as the aperture, bent to left and slightly upturned. Height 24 mm., diam. 14 mm. Gulf St. Vincent to St. Francis Island.

NEGYRINA Iredale 1929. Ovately-conical with prominent varices at about half a whorl; sculpture of spiral ridges and axial plications, nodulous at intersections; whorls strongly shouldered; anterior canal short, wide, recurved; columella curved, transversely wrinkled at lower part. Type—*Triton subdistortus* Lamarck.

N. SUBDISTORTA Lamarck 1822. Pl. 1, fig. 14. Medium size, rather thick, sub-distorted; whitish-fawn, mottled with brown, with spiral whitish band about the middle of last whorl, mouth white within; spiral ridges, fine, irregular noduled; axially plicate; spire elevated; whorls 6, convex; body whorl flattened at the side of the aperture and very convex on the dorsum; mouth oval, narrowed at the base, with a prominent tooth above; outer lip thick, denticulated within. Height 65 mm., diam. 35 mm. Not common. All round the coast.

N. PETULANS Hedley & May 1908 (*Eugyrina*). Pl. 1; fig. 13. From *N. Subdistorta* this shell is smaller; cream colour with rusty, irregular scattered dashes; sculpture much finer; whorls scarcely shouldered and rounder; anterior canal slightly longer and straighter. Height 35 mm., diam. 14 mm. Beachport, 150-200 fathoms. The deep water representative of *N. subdistorta*. Some South Australian specimens intergrade.

MAYENA Iredale 1917. Ovate-conic; varices prominent at about each half whorl; protoconch convex, smooth; adult whorls sharply angled, nodulation strong; canal short, open, recurved. Operculum oval, nucleus apical. Type—*Biplex australasia* Perry.

M. AUSTRALASIA Perry 1811 (*Biplex*). Pl. 1, fig. 16.

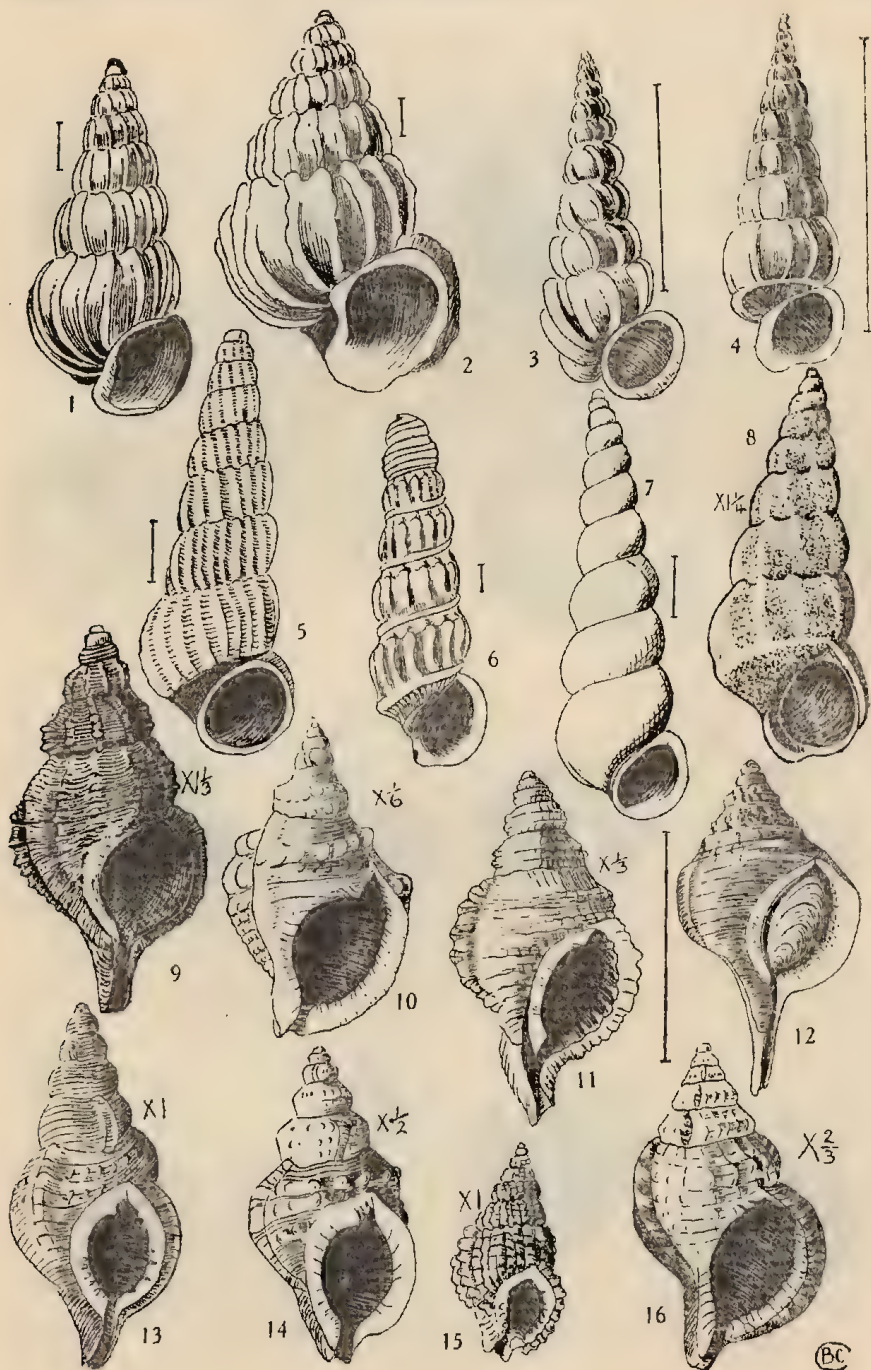
Large, solid; light-bluish grey, varices banded with white and darker, mouth very white; spiral threads crossed by close fine, growth lines; keel of the shoulder with strong rounded nodules; periostracum thin, like coarse muslin, with a minute erect hair at each intersection; spire a little higher than the mouth; body-whorl convex, two rows of nodules; mouth rounded; outer lip thick, inside, 2 rows of rounded teeth; inner lip with numerous wrinkles on the inner edge of canal, and a prominent tooth above. Height 48 mm., diam. 30 mm. Corny Point, Middleton.

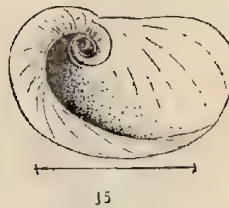
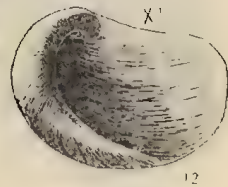
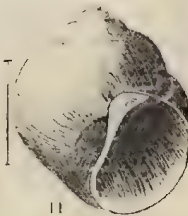
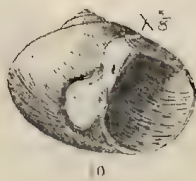
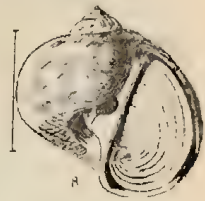
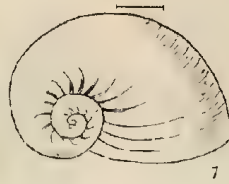
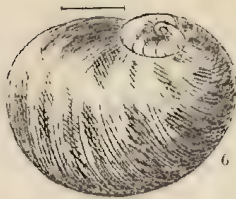
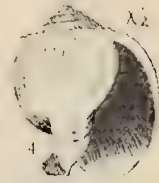
CYMATIELLA Iredale 1924. Ovately spindle-shaped, variced every three-quarters of a whorl; sculpture strong, smooth; axial ridges numerous crossed by numerous spiral ridges, nodulous at intersections, a peripheral ridge forming a shoulder; periostracum fine, velvety; protoconch white, shining, turbinate, globose, the tip minute and planorbid; adult whorls rounded, mouth oval; canal short; columella curved, nodulous anteriorly; outer lip heavily variced, dentated within. Type—*Triton quoyi* Reeve.

C. VERRUCOSA Reeve 1844. (*Cymatium*, *Personella*). Pl. 1, fig. 15. Small, golden-brown; axial ridges, about 9 between each varix, strong; spiral ridges, about 9, predominant on last whorl; periostracum dark brown; columella with 4 or 5 nodules, anteriorly, heavily varicose; outer lip with half a dozen elongated teeth within. Height 24 mm., diam. 13 mm. Common. On beach, general.

C. LESUERI Iredale 1929 (not *Personella eburneus* Reeve from the Philippines). Shape similar to *C. verrucosa* but smaller, and more finely sculptured. Whitish, with small pink apex; about 15 axial beaded cords between varices. Height 20 mm., diam. 11 mm. Not common.

C. GAIMARDI Iredale 1929 (not *Triton quoyi* Reeve). Appears to be a narrow deep water form of *C. verrucosa*. Height 22 mm., diam. 10 mm. Dredged both Gulfs.





EXPLANATION OF PLATES.

PLATE I.

- Fig. 1. *Scala platypleura* Verco.
- Fig. 2. *Scala acanthopleura* Verco.
- Fig. 3. *Clathrus aculeatus* Sowerby.
- Fig. 4. *Opalia australis* Lamarck.
- Fig. 5. *Propescala translucida* Gatliff.
- Fig. 6. *Parascala minutula* Tate & May.
- Fig. 7. *Cirsotrema invalida* Verco.
- Fig. 8. *Granuliscala granosa* Quoy & Gaimard.
- Fig. 9. *Cymatona kampyla* Watson.
- Fig. 10. *Charonia rubicunda* Perry.
- Fig. 11. *Cymatium waterhousei* Adams & Angas.
- Fig. 12. *Gondwanula fraterculus* Dunker.
- Fig. 13. *Negyrina petulans* Hedley & May.
- Fig. 14. *Negyrina subdistorta* Lamarck.
- Fig. 15. *Cymatiella verrucosa* Reeve.
- Fig. 16. *Mayena australasia* Perry.

PLATE II.

- Fig. 1. *Hypocassis bicarinata* Jonas.
- Fig. 2. *Antecephalum semigranosum* Lamarck.
- Fig. 3. *Antecephalum adcocki* Sowerby.
- Fig. 4. *Xenogalea nivea* Brazier.
- Fig. 5. *Antecephalum sinuosum* Verco.
- Fig. 6. *Natica stricta* Verco.
- Fig. 7. *Natica subcostata* Tenison-Woods.
- Fig. 8. *Natica sertata* Menke.
- Fig. 9. *Uber conicum* Lamarck.
- Fig. 10. *Uber incei* Philippi.
- Fig. 11. *Friginatica beddomei* Johnston.
- Fig. 12. *Sinum zonalis* Quoy & Gaimard.
- Fig. 13. *Propesinum albosuturum* Verco.
- Fig. 14. *Propesinum flindersi* sp. nov.
- Fig. 15. *Lamellaria australis* Basedow.
- Fig. 16. *Caledoniella contusiformis* Basedow.

C. COLUMNARIA Hedley & May 1908 (*Cymatium*).

Compared with *C. verrucosa* this shell is thinner, more slender, and with weaker sculpture. Colour pale-straw. Beachport to 20 miles west of Eucla, in 40-200 fathoms. This may be conspecific with *C. gaimardi*.

CASSIDIDAE.

Solid, subglobular or triangular, spire short, regularly variced; sculpture more or less nodulous; mouth elongate, narrow, contracted; canal short, recurved into an upturned snout; outer lip recurved, usually flattened, with a dozen long denticles; inner lip wrinkled. Operculum horny, concentric, elongated, semilunar, the nucleus at the centre of the inner margin. Animals active and voracious; sandy beaches, preying on bivalve molluscs.

Distribution, warm seas. Fossil—Eocene.

True "Helmet Shells" are huge and massive and are restricted to the tropics. Our members of this Family are termed "False Helmet Shells" and the Recent forms are practically unchanged since early Tertiary times. Some species of the Cassides are well suited for cameo-cutting, the layers of the shell being differently coloured and of a different hardness and texture.

HYPOGASSIS Iredale 1927. Medium size; varices about three-quarters of a whorl; spire very short; whorls strongly shouldered and nodulous, additional nodular rows present; mouth narrow; outer lip thickened, folded back, internally faintly denticulate with few teeth; columella nearly straight, widely reflected over the body whorl; false umbilicus narrow but open, umbilical cavity present. Type—*Cassis bicarinata decreseensis* Hedley 1923.

H. BICARINATA Jonas 1839 (*Cassis*). Pl. 2, fig. 1. Polished, shining; light fawn and white, circled by distinct spiral lines of dark brown alternating with white, about 7 on the body-whorl; about 6 brown bands on the reflected outer lip continuing as faint girdles round the shell; rather closely longitudinally plicate; spirally striately wrinkled anteriorly, elsewhere smooth; two or three spiral rows of tubercles, weakly developed on the body-whorl; protoconch pointed; adult whorls 5. Height 89 mm., diam. 63 mm. General, sandy beaches. The common South Australian species.

H. BICARINATA DECRESENSIS Hedley 1923. Smaller than the previous species; more closely longitudinally plicate; extremely low spired and somewhat roundly shouldered. Height 54 mm., diam. 33 mm. South-east of South Australia, and Kangaroo Island.

H. FIMBRIATA Quoy & Gaimard 1833 (*Cassis*). Differs from *H. bicarinata* in its smaller size, stronger sculpture, spirally striated wrinkled all over; blotched with light-brown; spiral colour bands indistinct; interrupted light brown lines; protoconch mammillate. Height 53 mm., diam. 38 mm. Smoky Bay to Vansittart Bay, W.A.

ANTEPHALIUM Iredale 1927. Small, ovate, comparatively strongly sculptured, mouth narrow, outer lip recurved, not strongly variced as a rule, columella reflected so as to leave only a minute false umbilicus. Type—*Cassis semigranosa* Lamarck 1822.

A. SEMIGRANOSUM Lamarck 1822 (*Cassis*) (*Phalium*). Pl. 2, fig. 2. Thin, solid, oval; dull brownish-white; sculpture at first, of about 8 spiral lirae overridden by very close, slanting, radial threads forming square nodules; middle of body-whorl smooth save for growth lines; spire acuminate, less than half the length of the body-whorl; protoconch, whorls 3, a little elevated, smooth; adult whorls 5; canal short, much recurved, gutter well marked; outer lip thickened, recurved but not folded back, internally smooth. Height 40 mm., diam. 30 mm. General. Fairly common.

A. SINUOSUM Verco 1904 (*Phalium*). Pl. 2; fig. 5. Small, oval; white, with about 5 spiral rows of faint rufous spots; spirally closely grooved; spire less than half the length of the body-whorl; adult whorls 3; mouth rather narrow, reverse ear-shaped; canal short, recurved; outer lip bearing no varix but a little thickened internally; columella finely wrinkled. Height 22 mm., diam. 14 mm. Beachport to Gulf St. Vincent, down to 22 fathoms. Rare.

A. SINUOSUM ANGUSTATUM subsp. nov. A narrow form of *A. sinosum* Verco. In place of the 5 rows of rufous spots there are oblique, wavy, or curved brown radial bands, starting from a row of spots below the suture. Backstairs Passage, 20 fathoms. Height 20 mm., diam. 10 mm. Type—Reg. No. D.10171, South Australian Museum.

A. ADCOCKI Sowerby 1896 (*Cassis*). Pl. 2; fig. 3. Small, solid; white, with spirals of small, bright, red-brown square dots; 6 rows on body-whorl, 20 spots to a row; spiral impressed lines, numerous, crossed by strong, slanting, axial threads, which form about 20 short axial ridges below the shoulder of the last whorl; spirals still well pronounced on the base; spire less than half the length of body-whorl; adult whorls 3; last whorl with a sloping shoulder, somewhat excavate; canal short, much recurved; outer lip heavily variced and folded back, internally toothed; columella very wrinkled; umbilical chink present. Height 27 mm., diam. 17 mm. Yankalilla to Western Australia. Rare.

XENOGALEA Iredale 1927. Small to medium size; sculpture of juvenile, more or less reticulate, the adult more or less smooth, with sometimes a nodulous, or even a keeled shoulder; spire short; mouth open, rarely denticulate within. Type—*Cassidopyrum* Lamarck (New South Wales). Only recent species of this species are known.

X. NIVEA Brazier 1872 (not *Phalium pyrum* Lamarck 1822). Pl. 2; fig. 4. Small, thin, oval; pure white, rather waxy, outer lip edged with yellow as is columella and part of the body-whorl in front of the mouth; varix bears red-brown blotches; spiral ridges, about 6, on early whorls with traces of axial lines; body-whorl with a flattened shoulder showing two elevated, round, spiral ridges, a third forming an angulate shoulder with a dozen elongated, conical nodules, and a similar row of nodules lower down on the otherwise smooth round body-whorl; spire very short; protoconch worn; adult whorls 4, shouldered; mouth wide; canal short, rather open, recurved, leading into the deep open false umbilicus; no umbilical chink; outer lip thin, recurved, not variced; columbella wrinkled internally, two major folds present; inner lip expanded, smooth. Height 45 mm., diam. 40 mm. Not uncommon on beaches. MacDonnell Bay to Port Lincoln.

NATICIDAE.

Subglobose, or ear-shaped; spire usually short; mouth entire, without canal or sinus; outer lip sharp, not reflected; inner lip callous, more or less reflected over the large umbilicus. Operculum horny, with few spirals, or with an exterior shelly layer. Distribution—Cosmopolitan, from low water to moderate depths. Fossil—Silurian. Colour very persistent, frequently preserved in the fossils. Animal carnivorous, very predaceous; some species live in sandy places, hiding under the surface and burrowing for bivalves which they pierce with their radula, boring a round hole, generally near the umbo where the shell is thinnest. The animal may be completely retractile within the shell or not retractile.

NATICA Scopoli 1777. Oval-globular, porcellaneous, solid, generally smooth; periostracum thin, polished; spire slightly elevated; mouth semi-lunar; umbilicus large, with a spiral callus. Operculum, shelly, spiral with many grooves. Type—*Natica canrena* Linne (China).

N. SERTATA Menke 1843 (*Natica collei* Recluz 1843). Pl. 2, fig. 8. Small, globose; white with chestnut spots, sometimes violet tinted; smooth, except for numerous short striations; protoconch of two smooth, convex whorls; mouth whitish, inside somewhat flamed; umbilicus deep. Height 15 mm., diam. 15 mm. Not common. On stones at low water. Beachport to St. Francis Island.

N. ELKINGTONI Hedley & May 1908. Small, globose, rather thin; dull white, apex orange, fading on succeeding whorls, persists as a faint subsutural band on body-whorl; smooth; umbilicus small, half filled by spiral callus which expands as a pad near margin of mouth. Height 9 mm., diam. 9 mm. Not common. Beachport to Venus Bay. Closely related to *N. Subcostata*, but differs by larger size and more elevated spire.

N. SAGITTATA Menke 1843. Small, globose; white, shining; closely axially plicate at suture and on base; reddish arrow-headed markings on last whorl; umbilicus filled by callus; columella white, narrow, canaliculate. Height 5 mm., length 9 mm.; breadth 7 mm. South Yorke Peninsula.

N. STICTA Verco 1909. Pl. 2, fig. 6. Solid, ovately-globose; shining, smooth with three spiral rows of brown marks, axially elongate and somewhat zigzag; spire scarcely raised; whorls $3\frac{1}{2}$, flatly convex; suture linear; mouth semi-circular; inner lip raised into a callous pad, which with that of the straight columella almost frills the large umbilicus. In juveniles the umbilicus is open to the apex. Height 5.25 mm., length 8.5 mm., breadth 7 mm. Beachport to C. Jaffa, 17-150 fathoms.

N. SUBCOSTATA Tenison-Woods 1877. Pl. 2; fig. 7. Small, globose; white, shining; axial ribs, numerous, regular, fine, on the penultimate whorl only; umbilicus plainly spirally ribbed; Height 5 mm., diam. 5 mm. Not common.

UBER Humphrey 1797. Sub-globular or depressed; generally smooth; whorls not numerous, umbilicated or having the umbilicus closed by a callus. Operculum, horny, with few spirals, nucleus nearly lateral, concave externally. Type—*Nerita mammilla* Linne.

U. CONICUM Lamarck 1822 (*Polinices*). Pl. 2, fig. 9. Medium size, moderately thick; pale pinkish or bluish-yellow with a broadish ill-defined brown spiral on the upper part of the whorls; periostracum thin, smooth, persistent; spire somewhat elevated; protoconch. $1\frac{1}{2}$ smooth whorls, slightly convex; adult whorls 5, rounded, last disproportionately large; mouth more than half the height of the shell; inner lip expanded at the labial callus which is thick; umbilicus small, hardly encroached on by the inner lip. Operculum light-brown, outer edge yellow. Height 50 mm.; diam. 34 mm. Very common. Beachport to Port Le Hunte. Between tide-marks, easily found by its long raised burrow roof on the surface of the sand at one end of which is the mollusc. The egg nidus, a broad spiral band built of sand, is a common object on the beaches in spring.

U. INCEI Philippi 1851 (*Polinices*). Pl. 2, fig. 10. Small medium, thick, depressed-orbicular; yellowish-white or purplish, shining; smooth, with a rather broad darker spiral band on the upper part of the whorls; spire very low; suture duplicated; inner lip with large pad-like callus; umbilicus large, wholly filled up. Height 20 mm.; diam. 34 mm. Common. On sandy ocean coasts, beyond low tide-mark. Robe to Port Le Hunte. Distinguished from *U. conicum* by its depressed shape, relatively large diameter, and brighter colour.

U. TASMANICUM Tenison-Woods 1875. Small, thick, depressed orbicular; pale reddish or whitish, banded with brownish or orange lines; base white, chestnut within; smooth, inner lip with prominent callosity which is spirally furrowed, a callus at the upper angle of the mouth. Height 13 mm., diam. 16 mm.

U. CONTROVERSA Pritchard & Gatliff 1913. Solid, globose; yellowish-white with two spiral darker bands on the body whorl, also a light coloured band below and adjoining the suture; smooth but for irregular growth lines; spire slightly elevated; whorls about 5; suture well defined with a strong enamel thickening internally; mouth ovate; outer lip rather strong; columella with narrow tooth-like ridge anteriorly; umbilicus angled, deep, partly covered by a semi-lunate callosity, which is convexly rounded on its surface and without any trace of a transverse sulcation. Height 15 mm., diam. 17 mm. South-east of South Australia.

U. PLUMBEUM Lamarck 1822. Globosely-ovate; livid ash-colour, with a narrow blood-red band beneath the suture; apex blue-black; umbilical area, lip, and edge of callosity bright blood-red; obliquely plicately striated; spire somewhat elevated, pointed; whorls rounded, smooth, slightly concavely excavate around the upper part; columella broadly callous; umbilicus narrow. Height 31 mm., diam. 30 mm. Beach, Kingston. Less high than *U. conicum* and darker coloured.

FRIGINATICA Hedley 1916. Small, naticoid; mostly uniform olive-buff; periostracum tending to peel off; spire slightly raised; whorls about 4; no callous pad on the columella; no umbilical spiral cord. Operculum horny, few-spiral. Type—*Natica beddomei* Johnston. An Antarctic naticoid group of rather featureless shells.

F. BEDDOMEI Johnston 1884 (*Natica effosa* Watson 1886). Pl. 2, fig. 11. Ventricosely sub-globose; faintly spirally lined; suture deeply channelled. Height 8.75 mm., diam. 7.5 mm. Royston Head.

SINUM Bolten 1798. Ear-shaped, flatly convex; growth striae well marked; periostracum thin, tending to peel off; spire depressed; whorls few; aperture very large, entire; umbilicus minute, covered by a reflection of the inner lip. Operculum minute, horny, scarcely spiral. Type—*Helix fuscum* Gmelin. Live on muddy sandy flats; the animal is much larger than the shell and not retractile within it.

S. ZONALE Quoy & Gaimard 1832. Pl. 2, fig. 12. White with yellowish periostracum. Height 10 mm., major diam. 28 mm.; diam. 21 mm. Common. All beaches, from low water to 100 fathoms.

PROPESINUM Iredale 1924. More ventrical than *Sinum*; spire convex; protoconch small, flatly convex, not defined; mouth semi-circular; inner lip reflected posteriorly but hardly encroaching on the wide, deep umbilicus. Animal retractile within the shell. Type—*P. umbilicatum minusculum* Iredale (New South Wales).

P. ALBOSUTURUM Verco 1909 (*Eunaticina*). Pl. 2, fig. 13. Solid, globosely obliquely oval; shining; white alternating with yellowish axial bands following the growth lines; a broad white spiral band immediately beneath the suture. Height 23 mm., major diam. 20 mm.; minor diam. 14 mm. Not very common. Gulf St. Vincent to St. Francis Island.

P. PICTUM Recluz 1843 (not *Sinum umbilicatum* Quoy and Gaimard. Closely related to *P. albosuturum*; thin, white, axially irregularly streaked with brown; a white spiral band beneath the suture and another at the periphery; growth lines, fine, crossed by very fine, close, spiral striations; outer lip rather produced; umbilicus deep. Height 22 mm., diam. 21 mm. Fairly common on beaches. Beachport to St. Francis Island.

P. FLINDERSI sp. nov. (not *Sinum coarctatum* Reeve—not *Sinum nitidum* Reeve). Pl. 2; fig. 14. Small, globose, thin; dead white; whole surface sculptured by numerous, fine, spiral striae, crossed by fine, irregular growth lines becoming coarser in the umbilicus; spire very short, convex, whorls four, rounded, rapidly increasing; suture rather deeply impressed; mouth wide, semi-circular, entire; outer lip thin; columella flexuous, scarcely reflected; umbilicus very wide. Locality—Outer Harbour, Gulf St. Vincent. (Type—Height 22 mm., diam. 21 mm. Reg. No. D10170, South Australian Museum). Largs Bay. Wallaroo. Most like *P. pictum*, distinguished by absence of colour, more pronounced sculpture and deep suture.

LAMELLARIIDAE.

Sub-globose or ear-shaped, thin, transparent, more or less internal, generally spiral, with a short, lateral and few whorled spire; aperture large, entire, oval. No operculum. Animal much larger than the shell; the mantle gradually grows over the shell until the latter becomes, in some genera, completely internal, the mantle being non-retractile; carnivorous, living upon *Hydrozoa*, *Alcyonaria*, and compound *Ascidiae*; eggs deposited in a nest hollowed out in the colonies of the latter. First embryonic shell is nautiloid, with spiral ridges; second resembles a *Carinaria*. These shells are united at their margins by a thin membrane. Distribution—Atlantic, Indian and Pacific Oceans. Fossil—Pliocene.

LAMELLARIA Montagu 1815. Shell internal, thin, pellucid; spire lateral, very small; aperture large, spreading; both lips regularly arched; no umbilicus. The mantle flaps form a permanent dorsal shield, wholly concealing the shell. Type—*Lamellaria perspicua* Linne.

L. OPHIONE Gray 1850. Oblong, ear-shaped, thin, open underneath exposing the whorls to the apex; white; growth lines fine, crossed by faint spiral striae; periostracum very thin, transparent, slightly iridescent, shining; protoconch of $1\frac{1}{2}$ smooth, flattish whorls; adult whorls 3, convex, the last very large; suture impressed; outer lip sharp, thin, the periostracum usually overlapping; inner lip spread as a narrow band over the columella. Animal larger than the shell, yellowish or whitish marbled with grey and usually with two blackish patches. Length 16 mm., height 9 mm. Uncommon. Beach, Gulf St. Vincent, Wardang Island, Backstairs Passage, Sceales Bay, Venus Bay, St. Francis Island, Cape Borda. Lives under loose stones at low water mark.

AUSTRALIS Basedow 1905. Pl. 2, fig. 15. Ear-shaped, thin; white, spire and inside pearly; growth lines fine, distinct, crossed by faint spiral striae; periostracum, transparent, yellowish; margin of outer lip with a shallow concavity anteriorly. Length 21.5 mm., breadth 16.5 mm., height 9 mm. Gulf St. Vincent, Backstairs Passage, 25 fathoms. From *L. ophione*, this shell is larger, body whorl less convex, spire larger, apex more central. Animal dull brick-red on the dorsal shield with an imperfect four-lobed white crown in the centre and three white blotches on the right side.

CALEDONIELLA Souverbie 1869. Shell internal, sub-globose, thin; periostracum thin, extending beyond the lip; spire much depressed, sub-lateral; whorls few rapidly increasing; aperture oblique, rather large, the extremities of the simple lip united

by a callus extending widely upon the whorl. Type—*Caledoniella montrouzieri* Souverbie.

C. CONTUSIFORMIS Basedow 1905. Pl. 2, fig. 16. Globose, oblique, heliciform; white, semi-translucent; growth lines faint; periostracum colourless, with raised, branching lines radiating from the apex; spire small, depressed; whorls about 3, rounded; suture channelled; aperture oblique, with a wide, shallow depression anteriorly; widely open, displaying the winding columella to the apex; shell not wholly calcareous, being in parts membranous, especially in the earlier and posterior portion of the last whorl. Height 28 mm., diam. 17 mm. Animal, dorsal shield wrinkled, impure white to light brown ground colour, of a deeper hue in the wrinkles; large black blotches spread over the surface. Backstairs Passage, 25 fathoms.

C. TESTUDINIS Basedow 1905. Shell calcareous, smaller than *C. contusiformis* but otherwise similar. Dorsal shield of animal more closely wrinkled than that of *C. contusiformis*, of an earthy brown colour, with more numerous black blotches in the centre of the crests produced by the wrinkles. Gulf St. Vincent, 25 fathoms.

C. PULCHRA Basedow 1905. Shell calcareous, otherwise similar to *C. contusiformis*. Dorsal shield of animal comparatively smooth, rich yellow colour, with large blotches of lighter, surrounded by wreaths of black. Gulf St. Vincent, 25 fathoms.

C. LABYRINTHA Basedow 1905. Shell destitute of calcareous matter, consisting of a soft, transparent membrane, otherwise similar to *C. contusiformis*. Dorsal shield of animal wrinkled, of a faint yellowish ground colour obscured by a labyrinthine structure produced by closely set, black, partly spiral lines. Gulf St. Vincent, 25 fathoms.

SHELL CLUB.

The Shell Club has decided upon carrying out a most ambitious scheme—the compiling of a guide to the whole of the shells of South Australia. Messrs. F. K. Godfrey and B. C. Cotton are editing the volume, and Mr. Cotton is drawing the plates. By special arrangement with the Club, a first instalment has been published, and the second forms part of this number of the "S.A.N."

WILD FLOWER SHOW—OCTOBER 16 and 17, 1931.

The Town Hall was again made available to the Society by the kindness of the Lord Mayor, who also opened the Show and delivered an excellent speech in support of the aims of the Society.

Owing to counter attractions and a sudden storm of rain on the Saturday evening, the admissions were much below those of former years, and the credit balance is just below £10.

Members and friends of the Society worked with great enthusiasm, and the general arrangements reflected credit on those who performed the arduous labour of arranging the great number of exhibits. As no official list of workers was kept it is quite impossible to enumerate the members who helped to make the Show such a fine one. In recording a (necessarily incomplete) list of sections of the work, it is to be regretted that it is impossible to specify the workers in these departments. The receiving of parcels, opening, arranging and labelling them occupied many members. Then came the Scientific classification, the referees being Mr. Black and Mr. Bailey. The Display Section was specially effective and entailed an enormous amount of work. The Sales Department supplying the public with Waratahs, W.A. Everlastings and Kangaroo Paws, as well as specimens of the native flora of our own State, did splendid work. Mr. Burdett, of Basket Range, and Mr. Ashby, of Blackwood, made a fine showing of native and other flowers grown in their gardens. Dr. Pulleine showed desert plants from foreign countries, and Dr. Cleland an assortment of interesting botanical specimens. The Agricultural Department made an interesting exhibit, arranged by Mr. Pritchard. Minerals were exhibited by Mr. Thomas. The Aquarium Society made a most attractive display. Mr. Lea showed cases of insects from the Museum. Mr. Machell showed pond life of many varieties. Messrs. Laubman & Pank exhibited the latest in microscopes and lent his episcopes without charge for the evening lectures. The Forestry Department made an interesting exhibit of timber and its products. Captain White exhibited birds and lectured on them, while Mr. Godfrey showed shells and explained them. Mr. C. T. Madigan, of the University, showed fine photographic views of Central Australia. Mr. Ising exhibited herbarium specimens. The exhibition of paintings was very attractive. The tables showing the school collections were very fine this year. Thirty schools sent collections, Myponga School gaining the first place, followed by Basket Range, Aldgate, Monarto South, Port Lincoln, and Maggea. Book prizes have been sent to the schools mentioned and certificates to all the schools. Among the evening lectures delivered was one delivered by Mr. Bellchamber, of Humbug Scrub. Members of the Microscopic Club made an attractive exhibit. Mr. Wiley showed wood-turning in native woods.

FORTY-EIGHTH ANNUAL REPORT
of the
FIELD NATURALISTS' SECTION
of the
ROYAL SOCIETY OF SOUTH AUSTRALIA
for the Year Ending,
AUGUST 31st, 1931.

It is with much pleasure we submit our report upon the activities of the Society for the past year.

EXCURSIONS.—During the year under review, 22 outings have been conducted, and these have on most occasions been well attended. There is, however, room for improvement in this respect, and we would like to see a greater number of members participating in the outings during the coming year.

The outings arranged included the study of Botany, Geology and Conchology, and visits made to places of interest, such as the Waite Agricultural Research Institute, Botanic Gardens, Museum, Zoological Gardens, and the Aviaries of Mr. Simon Harvey; also, at the invitation of Dr. A. W. Hill, a pleasant afternoon was spent at his residence, where he displayed a number of interesting things obtained on his visits to the South Sea Islands.

LECTURES.—Five lectures were given in the Public Lecture Room during the year, as under:—

"Trees of Adelaide Plantations," by Mr. J. F. Bailey.

"The Unknown Bali," by Sir William J. Sowden.

"Europe in 1930," by Mr. J. M. Black.

"Palestine," by Lt.-Col. D. Fulton, C.M.G., C.B.E.

"A Trip to Cairns," by Mr. A. J. Morison.

Members were also favoured with a lecture on "Ancient Astronomy," by Dr. B. G. Maegraith, M.B., B.S., and an interesting and entertaining "Chat on the Wild Flowers of Western Australia," by Mr. Edwin Ashby.

EXHIBITS.—One evening was devoted to exhibits, Mr. E. H. Ising being in charge, and at other meetings exhibits have been shown. This is a feature that we should like to see extended, at our meetings, and during the coming year, we should like members to bring along any exhibits they possibly can, and thus Botanic Gardens on July 25th, members took the opportunity help to make our meetings more interesting.

PRESENTATION.—On the occasion of the last visit to the of presenting Mr. J. F. Bailey with two botanical works comprising a bound volume of "The Flora of South Australia," by

Mr. J. M. Black, and "The Flora of Victoria," by Professor A. J. Ewart, as a small token of the valuable services he had rendered to the advancement of the study of science in the State of South Australia.

"THE SOUTH AUSTRALIAN NATURALIST."—Our journal has been published quarterly during the year, under the editorship of Mr. W. Ham. The part to be issued in August will complete Volume 12.

HERBARIUM.—The work in the Herbarium has been continued during the year, and at the meetings held weekly, on Monday evenings, except during the University vacation periods, the mounting and arranging of specimens has been proceeded with.

WILD FLOWER SHOW.—The 1930 Annual Show was held on October 10th and 11th, in the Adelaide Town Hall, which was made available by the courtesy of the Lord Mayor. The Show arrangements were successfully carried out under the direction of Mr. E. H. Ising, who undertook the secretarial work, and the standard of past shows was well maintained.

OBITUARY.—It is with deep regret that we have to record the death of two of our esteemed members, Miss Kitty Le Vasseur and Miss Elsie Hocking, who have passed away during the year.

Miss E. Hocking has occupied the position of Minute Secretary, and rendered useful service to the Section in that capacity.

F. K. GODFREY, Chairman.

H. WOODLANDS, Hon. Secretary.

REPORT OF SHELL COLLECTORS CLUB.

Attendance at the meetings has been fair and although some, through removals and other causes, are now absent, others are coming in and are full of zeal.

During the year, there have been 17 meetings with an average attendance of 10.

Many families of Gastropods (Univalves) have been studied, and effort is being made to bring our list of Mollusca up-to-date.

The meetings are now limited to the first Monday in each month, and more time is given to those shells which the members are likely to find on the various beaches of the State.

FIELD NATURALISTS' SECTION OF THE ROYAL SOCIETY OF SOUTH AUSTRALIA, INC.

Statement of Receipts and Expenditure for Year Ended August 31st, 1931.

RECEIPTS.

	£	s.	d.
To Balance from 1929/30	18	2	11
" Subscriptions	36	18	9
" Bank Interest	1	12	0
" Royal Society Donation, 1929/30 . .	33	15	0
" Flower Show	37	10	0
" Subscription to S.A. Naturalist . . .		6	8
" Sale of Paper		5	6
	£128 10 10		

EXPENDITURE.

	£	s.	d.
By Postages, etc.	9	5	6
" Printing and Stationary	66	2	10
" Advertising	2	0	6
" Hire of Hall and Lantern	7	14	6
" Library Books	2	3	3
" Travelling Expenses		19	2
" Royal Society	32	0	0
" Excursion Account Loss	2	11	0
" Dredge Repairs		3	0
" Bank Balance		2	5
" Credit Balance in hands of Hon. Treasurer	5	8	8
	£128 10 10		

E. V. DIX, Hon. Treasurer.

Audited and found correct.

WALTER D. REED, Chartered Accountant,
F.C.A. (Aus.)

WILLIAM H. BROADBENT.

Auditors.

EXCURSION ACCOUNT. PROFITS.

	£	s.	d.
Basket Range trip, loss transferred to			
Flower Show	2	12	6
Launch trip, transferred to payments ..	2	11	0
	£5	3	6

LOSSES.

	£	s.	d.
1930.			
Oct. 8 Basket Range Trip	2	12	6
1931.			
Feb. 14 Launch Trip	2	11	0
	£	s.	d.

E. V. DIX, HON. Treasurer.

REPORT OF MICROSCOPIC COMMITTEE.

The Microscopic Committee has held the usual number of meetings during the year, with a good attendance of members and visitors, including several visits from the Junior Legacy Club.

The Lectures, covering a wide range of Natural History, have been very interesting and instructive, and have been illustrated by the Micro-Projector and members' instruments. Members have displayed numbers of very interesting slides. The members desire to heartily thank the Society for the use of the room each month, also those who so kindly gave of their time and knowledge in the Lectures. Also Messrs. Laubmann and Pank for the use of their Micro-Projector and their assistants who have helped in many ways. We desire to acknowledge the courtesy of the Victorian Microscopic Society for sending their monthly reports.

The lecturers have included Mrs. Best, University; Mr. H. M. Hale, Museum; Chairman, Mr. Collins; Hon. Secretary, Mr. Briggs, "Advertiser" Office.

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The South Australian Naturalist

The Journal of the Field Naturalists' Section of the Royal
Society of South Australia and of the South Australian
Aquarium Society.



CONTENTS.

—:O:—

Native and Introduced Plants, growing on a roadside at Mount Lofty, South Australia	29-34
Death of Mr. David J. McNamara	34
South Australian Shells (including descriptions of new Genera and Species). Part III, by Bernard C. Cotton and P. K. Godfrey	35-86
After the Drought—Life on the Great Stony Desert, by Geo. Aiston (Marree, S.A.)	87-88

The authors of papers are responsible for the facts
recorded and opinions expressed.

Address of the Section: C/o Royal Society's Rooms, Institute
Building, North Terrace, Adelaide.

Published Quarterly

Single Copy—NINEPENCE

Obtainable from Cole's Book Arcade, No. 14 Rundle Street,
Adelaide.

Felstead & Omsby, Printers, Delmont's Building, Anster Avenue, Adelaide.

The South Australian Naturalist.

VOL. XIII. ADELAIDE, FEBRUARY, 1932. No. 2.

NATIVE AND INTRODUCED PLANTS GROWING ON A ROADSIDE AT MOUNT LOFTY, STH. AUSTRALIA.

By ERNEST H. ISING.

The list of plants given here represents observations made over a period of years, from 1923 to 1931.

The month of flowering is recorded, and is indicated by numerals representing a particular month, i.e., 1 represents January, 2 February, etc. It is not necessary to show each year separately, and the months given against the species indicates the flowering period from their earliest to latest time of flowering. Abnormal or unseasonal heavy rains occasionally stimulates an unusual flowering period; these will be indicated where possible. The flowering periods of our native plants form an interesting study. We can readily understand the stimulus of spring on the flowering activities of the plants, and this also applies, to a lesser extent, to the winter period. The puzzling thing is, what retards the "spring" stimulus in those plants which do not flower until spring is over, and what of those that flower in late summer and autumn? Where the seasons are regular so the flowering period is regular, but in our north and far north the plants flower "whenever it rains." This northern part of our State of course does not get a winter rainfall, but most of its scanty and uncertain rainfall is recorded in the summer months. When the rain is heavy enough the plants flower, several times in the year if the rains are some time apart. The conditions for plant life in our north are very severe, and it is only after good rains that the vegetation can flower. There is a very definite stimulus for flowering after heavy rains in this class of country. This subject of the flowering periods of our flora has been dealt with in a paper by Miss Jean Heyward, M.Sc., in the Proceedings of the Royal Society of Victoria, Vol. 43, Part II., 1931, p. 154, entitled "Flowering Periods of Victorian Plants."

POLYPODIACEAE. *Pteridium aquilinum* (L.), Kuhn. Bracken fern; very little of it to be seen.

SELAGINELLACEAE. *Selaginella Preissiana*, Spring. 7. This moss forms some dense patches on the side of the cutting.

GRAMINEAE. *Stipa elegantissima*, Labill. 11, 12. A perennial grass, but few plants seen. *Danthonia paniculata* (Labill), F.v.M. 10, 11. Just a few plants growing near the gutters. *Briza maxima*, L., and *B. minor*, L. 11. Quaking or shivery grass; a common weed. *Holcus lanatus*, L. 11, 12. Yorkshire fog; a common grass at Mt. Lofty, and forming large tussocks. *Dactylis glomerata*, L. 11, 12. Cock's foot grass; a widely distributed species. *Avena fatua*, L. 11. Wild oat; only an occasional plant seen. *Poa caespitosa*, Forst. 12. A grass that favours wet districts. *Lolium perenne*, L. 12. Rye grass; an introduced species of wide distribution. *Aira caryophyllea*, L. 11, 12. A small plant, only sparsely spread; not native. *Bromus unioloides*, H.B. et K. 11, 12. Prairie grass; doing well in this district and easily spread.

CYPERACEAE. *Lepidosperma lineare*, R.Br. 5, 6. A small rush plant having a perennial root-stock. *L. semiteres*, F.v.M. 1, 2, 3. A rush plant having thread like stems up to 5 feet long and forming large tussocks. *Gahnia psittacorum*, Labill. 2. A tall plant having flowering stems 4 to 5 feet long or even longer. When the fruits are ripe they are suspended by a fine thread, and the numerous brilliant red fruits swaying in the wind make a beautiful sight.

JUNCACEAE. *Juncus pauciflorus*, R.Br. 10, 11, 12. One of the common rushes in Mt. Lofty Range growing in wet situations. *J. pallidus*, R.Br. 11. A rush usually taller than the preceding and with stouter stems; moisture loving and common. *J. bufonius*, L., and *J. capitatus*, Weig. 10, 11. Two small annual rushes, only a few inches in height, and growing in or near gutters. A common weed and flowering at various times.

LILIACEAE. *Lomandra micrantha* (Endl.), Ewart. 5, 6, 7. A perennial plant flowering in the winter and having dull maroon flowers. Its leaves are long, hard and cylindrical, and they enable the plant to grow in the unfavourable position of a sloping rock face. *L. dura*. 10. A rush-like lily. *Tricoryne elatior*, R.Br. 12. A slender hot-weather plant with scanty foliage. *Dichopogon strictus* (R.Br.), J. G. Bak. 11. A beautiful vanilla-scented flower of heliotrope shade. *Xanthorrhoea semiplana*, F.v.M. The common grass tree of the stringybark forests, usually flowering in the spring; only young plants were observed.

Burchardia umbellata, R.Br. 11. Milkmaids.

ORCHIDACEAE. *Caladenia dilatata*, R.Br. 10, 11. Our commonest "spider" orchid, but only two specimens have been seen. The four species of orchids recorded here are all growing on the slope of the road cutting, and it is more probable that they came to their present situation originally by means of seeds than by spreading of tubers from the parent plant. This is always an interesting speculation, as seedling orchids have rarely been found, although our orchids have wonderful and ingenious mechanisms and traps to secure fertilization by the aid of insects. *Thelymitra longifolia*, Forst. 10. Only a few plants were observed. *T. pauciflora*, R.Br. 10, 11. This species is plentiful on the shady side of the cutting growing amongst moss. *Pterostylis nana*, R.Br. 9. I counted 22 of this species growing on the rock-face of the cutting from near the top to the bottom, a distance of 12 feet. They seemed to prefer the places where there was most moisture.

PROTEACEAE. *Grevillea lavandulacea*, Schlecht. 6, 7, 9, 10. Only a few plants of this were seen. *Hakea rostrata*, F.v.M. 10, 11. Some of these plants were cut down to ground level and have since grown up again, the rootstock sending up new shoots. *H. ulicina*, R.Br. 10, 11. A common plant of the nearby scrub; several seedlings are growing on the cutting. *Isopogon ceratophyllus*, R.Br. 10, 11. Another frequent constituent of the stringybark forest in this region. Several plants grow on the top of the cutting. *Banksia marginata*, Cav. 1, 2, 3, 4, 5, 6, 7, 12. It will be noticed that this plant flowers for eight months in the year, and it is remarkable that it does not flower in the spring. This plant grows up from the base after being cut down. *Persoonia juniperina*, Labill. 1, 2, 3, 4, 5, 6, 7, 8. This plant has a long flowering period, which is always in the unfavourable time of the year. I have seen plants for several years begin their flowering regularly on the first day of January, and they usually bloom for six months.

SANTALACEAE. *Exocarpus cupressiformis*, Labill. 1, 2, 3, 4, 5, 6. Mr. Black ("Flora of S.A.", Vol. II., p. 167) records this tree, the native cherry, as flowering from August to February, so it would appear that it flowers all round the year.

POLYGONACEAE. *Rumex Acetosella*, L. 6, 11, 12. Sorrel, a garden weed of no use. *R. obtusifolius*, L. 10. The broad dock and a very difficult weed to eradicate on account of its long tap root.

CAROPHYLLACEAE. *Polycarpon tetraphyllum*, Loeffl. 10. A weed, although probably a native.

LAURACEAE.....*Cassytha glabella*, R.Br. 1, 2. A twining and climbing parasite living on shrubs or trees.

PITTOSPORACEAE. *Marianthus bignoniaceus*, F.v.M. A climber having beautiful golden-red bells nearly an inch long, hanging by fine threads. 1, 2, 7.

ROSACEAE. *Acaena Sanguisorbae* (L.f.), Vahl. 10, 11, 12. a diffuse and trailing herb growing where moisture is plentiful. *Rosa canina*, L. 10, 11. Dog rose. *Rubus fruticosus*, L., and *R. laciniatus*, Willd. 12. Blackberries which have become a pest in Mount Lofty Range.

LEGUMINOSAE. *Acacia melanoxylon*, R.Br. 9. Blackwood. One small tree only observed. *A. vomeriformis*, A. Cunn. 8. Only one plant was seen and this was destroyed when the roadside was being cleared in 1924. No seedlings have been observed as yet, although many seeds must have been shed by the flowers. *A. myrtifolia* (Sm.), Willd. The scrub wattle always noted for its rich yellow flowers and thick margins to the "leaves." 9, 10. *A. rhetinodes*, Schlecht. 1, 2, 3, 5, 6, 7, 10, 12. A wattle that grows usually in damp gullies and flowers all the year round. *Daviesia ulicina*, Sm. 9, 10, 11. *D. corymbosa*, Sm. 10, 11. Both common shrubs of the stringybark forest. *Pultenaea daphnoides*, Wendl. 9, 10. The dominant shrub of the adjacent areas, with *Platylobium obtusangulum*, Hook, as a plentiful undershrub in the same formation. 9, 10, 11. *Dillwynia hispida*, Lindl. 10, 11, 12. This is a small shrub with bright red flowers, but is not very plentiful. *Gompholobium minus*, Sm. 12, 1. A plant that I had under observation in 1925, opened its first flower on December 8, three days later 3 flowers were open, while 12 flowers were open together in another three days. On this last day the flowers were open before 8 a.m. as the day promised to be hot, and the temperature eventually went to 102 deg. F. A change came during that night with a cool breeze blowing from the west next morning when only a few flowers were out. On December 29 only 4 flowers were out, and on January 15 only one remained in flower. This plant grew on the steep rock-face of the cutting and was evidently stimulated by the hot weather. *Cytisus canariensis* (L.), Steud. 4, 5, 10, 11, 12. Canary broom. This plant is becoming a pest and should be proclaimed a noxious weed. *C. scoparius* (L.) Link. 10, 11, 12. Broom. Not a pest like the former, and a more handsome plant. *Trifolium procumbens*, L. 11, 12. Hop clover. *T. repens*, L. 5, 11, 12. White clover. *T. glomeratum*, L. 10, 11. Common introduced clovers.

TREMANDRACEAE. *Tetratheca pilosa*, Labill. 9, 10, 11, 12. This is our heather, which has flowers from pure white,

delicate pink, pale heliotrope, graduating to dark violet, through all the various shades. In the spring the shrubs are a mass of flowers and make the hillsides gay with their colour.

DILLENIACEAE. *Hibbertia sericea* (R.Br.), Benth. 10, 11, 12. *H. stricta*, R.Br. 10. Silky and stiff guinea flower.

GUTTIFERAE. *Hypericum Japonicum*, Thunb. 12.

VIOLACEAE. *Viola Sieberiana*, Spreng. 10. The small native violet with blue flowers.

THYMELAEACEAE. *Pimelea spathulata*, Labill. 9, 10, 11. *P. humilis*, R.Br. 11. The tall and dwarf rice-flowers. *P. phyllicoides*, Meisn. 11, 12. The white flowers of this plant are sweetly scented.

LYTHRACEAE. *Lythrum Hyssopifolium*, L. 12. A common plant in or near running water.

MYRTACEAE. *Eucalyptus Baxteri*, Maid. et Blak., 12, and *E. obliqua*, L'Her. 2, 12. The brown and white stringybarks. *Leptospermum scoparium*, Forst. et. f., 11, 12, and *L. myrsinoides* Schlecht. 10, 11, 12. The prickly and non-prickly teatrees, shrubs of equal size and often growing together.

OENOTHERACEAE. *Epilobium junceum*, Sol. 11. A willow herb growing in gutters.

HALORRHAGIDACEAE. *Halorrhagis tetragyna* (Labill), Hook. f. 10, 11. The tops of the raceme of flowers have a drooping habit. Compared to the other parts of the flower the anthers are very large and may possibly cause the droop, or is it an adaptation for anemophilous fertilization?

UMBELLIFERAE. *Trachymene heterophylla*, F.v.M. 1, 2, 3, 4, 5, 6. A summer flowering plant with small white flowers. The first leaves of seedling plants and also those on new shoots springing from the root-stock are divided, but the later foliage consists of narrow leaves without any branching. Hence the specific name, which means leaves of different shapes. *Xanthosia pusilla* Bunge. 10 and 11. A small herbaceous plant with cream flowers.

EPACRIDACEAE. *Acrotriche fasciculiflora* (Regel) Benth. 7, 8, 9. A plant whose flowers are borne on the base of the stem from ground level to a height of about a foot according to the age of the shrub. *A. serrulata* (Labill), R.Br. 5, 6, 7, 8, 9. The flowers are situated on the wood of the previous year's growth. *Epacris impressa* Labill. 2 to 10 inclusive. The common heath has a remarkably long flowering period. *Astroloma conostephioides* (Sond.) F.v.M. 4, 5, 6, 7, 8. The flame heath; winter flowering. *A. humifusum* (Cav.) R.Br. 3, 4, 5. Cranberry. *Leucopogon virgatus* (Labill.), R.Br. 10, 11.

GENTIANACEAE. *Erythraea australis* R.Br. 1.

PLANTAGINACEAE. *Plantago lanceolata* L. 3, 4, 10, 12.

RUBIACEAE. *Opercularia varia* Hook. f. 10, 11.

CAMPANULACEAE. *Wahlenbergia gracilis* (Forst. f.) A.D.C. 12. Our bluebell which is a widely spread plant.

GOODENIACEAE. *Goodenia geniculata* R.Br. 10, 11, 12. *G. primulacea* Schlecht. 10, 11, 12. These two plants flower into the hottest part of the summer. *Scaevola microcarpa* Cav. 10, 11, 12. The hand flower.

STYLIDIACEAE. *Stylidium graminifolium* Swartz. 11, 12, Only one trigger plant was seen.

COMPOSITAE. *Olearia grandiflora* Hook. 10, 11, 12. Our biggest daisy in the hills; the flowers are quite two inches across. In 1924 a plant was cut down to ground level; it was flowering again in 1928. In November, 1929, this plant sent up about 40 new stems about a foot long each having a flower head. Only one flower is borne on each stem, and they made a fine display in that year. *O. ramulosa* (Sond. et F.v.M.) Benth. 2, 3, 4, 5. One of our summer and autumn flowering plants.

Chrysanthemum leucanthemum. L. 12. The introduced ox-eye daisy which has spread in wet places about Mt. Lofty. *Cotula coronopifolia* L. 9. A plant that only grows when there is plentiful moisture. *Erechtites quadridentata* (Labill) D.C. 11, 12, 1, 2, 3, 4, 5. A woolly daisy. *Cryptostemma calendulaceum* (L.) R.Br. 10. The Cape dandelion. *Gnaphalium Japonicum*. Thurb. 5, 11, 12. A short woolly plant with small flower heads. *Ixodia achilleoides*, R.Br. 1, 2. The plant that grows so freely after fires. *Sonchus oleraceus* L. 3. The sow thistle.

DEATH OF MR. DAVID J. McNAMARA.

The Section has lost a talented member by the death of Mr. D. J. McNamara, who had acted as Press Correspondent for several years. His reports were always readable and showed great journalistic capacity. Many of our members have also enjoyed the short articles supplied to the press under the pen-name of "Agapetus." In these, which became a feature of the weekly issues of "The Express and Journal," Mr. McNamara showed that wide range of learning and shrewd observation joined with a quite unusual felicity of expression which was so characteristic of all his writings.

SOUTH AUSTRALIAN SHELLS.

(Including descriptions of New Genera and Species).

PART III.

by BERNARD C. COTTON and F. K. GODFREY.

O

In this part the following families are treated:—

Ianthinidae, *Merriidae*, *Carinariidae*, *Atlantidae*, *Cypraeidae*, *Volutidae*, *Olividae*, *Cancellariidae*, *Terebridae*, *Conidae*, *Fasciolaridae*, *Colidae*, *Turbinellidae*, *Verconellidae*, *Mitridae*, *Harpiidae*, *Buccinidae*.

IANTHINIDAE.

“Violet-snails.” Globose, thin, fragile; violet to purple shades, colour deeper on the base than on the spire; no periostracum; growth lines distinct; spire depressed, conoidal; protoconch sinistral, minute, blunt, oblique, of about three whorls, smooth, flatly convex; adult whorls few, rounded, rapidly increasing, last large, angular at its greatest diameter; base flatly convex; suture impressed; mouth squarish, effuse at the base of the columella; outer lip simple, thin; columella thin, twisted, expanded below; no umbilicus; no operculum. Distribution—The great oceans. Fossil—Pliocene. Gregarious, live in myriads, floating with the mouth of the shell uppermost, in the warm and temperate oceans. They feed upon jelly-fish. The foot secretes an elongated gelatinous raft or float, filled with air bubbles, to the underside of which the eggs are attached. Egg capsules beneath the further end of the raft have been observed to be empty when those in the middle have contained young with fully formed shells, and nearer to the animal they are filled with eggs. The raft is found in both sexes and can be detached at will. These oceanic snails have no power of sinking and rising in the water but are constantly at the surface. When touched, they exude a violet fluid which clouds the water around. They have no eyes, and are sometimes termed the “Blind Snails of the Sea.” On very rare occasions the *Ianthinae* are cast up on our beaches in such numbers as to form a long violet line.

IANTHINA Bolten 1798. The generic description is that of the family. Type—*Helix ianthina* Linne (*I. fragilis* Lamarck). About thirty species have been described but many have been shown to be conspecific.

I. VIOLACEA Bolten 1798. Pl. 1, fig. 1.

"Large violet-snail." Violaceous-white above, uniform purplish or violet below; growth lines irregularly plicate; whorls slopingly convex, with obtusely angulated periphery; base rather flattened; outer lip slightly sinuous and scarcely notched. Height 15, diam. 18 mm. Not common. General—South and Western Australia.

I. CAPREOLATA Montrouzier 1859 (= *I. exigua* Lamarck).

Violet, darker in small specimens, light banded at the sutures; growth lines dense, regularly plicate; spire short, not sunken at the sutures; whorls 4, somewhat flattened above, forming an obtuse peripheral angle; outer lip with deep, sharply angular notch, corresponding with the flexuous growth striae. Height 8, diam. 10 mm. Not common. General—South and Western Australia.

MERRIIDAE.

Small to minute, depressed, orbicular; smooth or faintly lined; whorls few, convex, body-whorl sometimes angular; mouth large, rounded, entire; outer lip curved, simple, sharp; umbilicus deep, wide, round; operculum shelly, scarcely spiral. Distribution—Australia, West Indies, China. Fossil—Miocene. Found in beach shell sand.

NARICAVA Hedley 1913.

Small, thin; growth lines numerous, distinct, as fine ridges, especially on the base; spire small, a little elevated; body-whorl expanded horizontally and obtusely keeled at the periphery; operculum, thin horny, few spiral, like that of *Uber*. Type—*Adeorbis angasi* A. Adams 1863.

N. VINCENTIANA Angas 1880 (*Adeorbis*) (= *Vanikoro denselaminata* Verco 1909). Pl. 1, fig. 2.

Globosely oval; dull white; growth lines erect, close set and becoming progressively more crowded; crowded oblique growth lines and a bold, twisted keel winding down the large, deep umbilicus, and outside this a furrow which gets wider and shallower on the base of the shell; protoconch of $1\frac{1}{2}$ whorls, with three bold spiral ribs ending abruptly; no spirals on the convex adult whorls; mouth oval. Height 8, diam. 9 mm. Uncommon. General, down to 22 fathoms. Also Western Australia.

N. KIMBERI Verco 1907 (*Adeorbis*). Pl. 1, fig. 5.

Thin, oval; white; growth lines, crowded, fine, curved, more pronounced on base; spire lower than *N. vincentiana*; protoconch of half a whorl, buried, smooth, rounded, marked off from the

2½ adult whorls by a scar; body whorl sharply keeled at periphery; base very flatly rounded and pressed flat; mouth roundly oval; umbilicus wide, not defined. Height 1.2, diam. 3.7 mm. Uncommon. Gulf St. Vincent, beach to 20 fathoms.

N. FLINDERSI sp. nov. (Formerly recorded as *Vanikoro ligata* Reculz 1843, from the Philippines. Not *Vanikoro quoyana* Adams). Pl. 1, fig. 3.

Small, globose; yellowish-white; spiral ribs, close fine, crossed by numerous transverse undulations, more prominent in the umbilical region; spire short; protoconch of 3 whorls, smooth, polished; adult whorls 3, globose, suture slightly channelled, mouth semicircular, entire; outer lip and inner lip, simple, thin; umbilicus narrow, deep. Type—Height 9.5, diam. 9 mm. Corney Point. (Reg. no. D.10172 S. Aust. Mus.). Distribution—Beachport to St. Francis Island, beach to 150 fathoms, alive to 55 fathoms. Not uncommon.

ONUSTIDAE. (= *Xenophoridae*).

“Carrier Shells.” Conical, trochiform, whorls flattened, periphery keeled; very often soldering shells, etc. to its upper surface; operculum large, horny, subannular, nucleus lateral, dextral; muscular impression sinistral, semilunar, extending the whole length. Distribution—Indian and Pacific Oceans and adjacent seas, also Mediterranean. Fossil—Devonian. The animal has a small foot adapted for jumping or scrambling, the front portion expanded, and tapering behind. Progress is by extending the front dilated part of the foot and drawing the hinder portion up to it, jerking the shell forwards at every movement. The habit of sticking stones and dead shells to the upper surface of the whorls is a family peculiarity, and is carried to such an extent in some instances as to conceal the volutions and give the structure the appearance of a small pile of stones, shells and other debris. The debris is agglutinated to the whorls at the sutures as growth continues. The shells attached are frequently single valves of Pelecypods with the interior facing outwards. One species dates back to the Eocene of North America, and is still living in the West Indies, which is a strong testimony to the protective value of the device by which the members of this family unwittingly defend themselves. The “Carrier Shells” inhabit deep water.

ONUSTUS Humphrey 1797. (*Xenophora* Fischer 1807).

Trochiform, concave or flattened on base; mouth large, oblique; outer lip very oblique, sharp; juvenile umbilicated, adult imperforate; operculum trapezoidal. Type—*Xenophora solaris* Linne.

O. PERONIANUS Iredale 1929 (not *Xenophora tatei* Harris, a Tertiary Fossil). Pl. 1, fig. 4.

Medium size; white or yellowish, the ridges upon base yellowish-brown; growth lines strong, irregular, oblique, crossed by flexuous, curved, oblique striae; base with numerous sharp-ridged curved and granose ribs with fine thread lines between, crossed by distinct spiral ribs; spire conical; slightly convex, protoconch conic, whorls few, convex, smooth, polished, white, with marks where very small fragments have formerly adhered; adult whorls 9, the last keeled; base flat; mouth low, broad, inside porcellanous; outer lip produced above; inner lip reflexed, forming a thick, white, shining callus; young shells narrowly umbilicate, adult shells without umbilicus; operculum squarish. Height 9, diam. 18 mm. St. Francis Island 15-20 fathoms.

Four specimens. Upper surface almost or quite hidden by the agglutinated shells. The New Zealand species—*O. corrugatus* Reeve—is larger and relatively higher and appears different because the shells adhering to it are different from those found in South Australia.

CARINARIIDAE.

Capulus-shaped, small, thin, transparent, glassy, sides compressed; protoconch posterior, recurved, scarcely spiral; dorsal keel fimbriated; aperture large, oval, entire. No operculum. Distribution—Mediterranean, Atlantic Ocean, Indian Ocean, China Seas, Tasman Sea. Fossil—Miocene. The animal is elongated, gelatinous, translucent, granulated, and several times larger than the shell which protects the more delicate organs; head thick, cylindrical; tentacles long, slender, eyes near the base; tail large, laterally compressed; nucleus stalked, covered by the shell. This pelagic mollusc is organised for swimming (in a reversed position) in the open sea, the foot compressed to form a sort of fin, bears a sucker, to anchor itself temporarily to floating bodies. Feeds on jellyfish and other soft bodied animals.

CARINARIA Lamarck 1801.

Shell paucispiral in one plane, thin, translucent; protoconch of 4 whorls, smooth, shining, helicoid, spirally oblique, apex pointing to the left. Type—*Carinaria vitrea* Lamarck.

C. AUSTRALIS Quoy & Gaimard 1833. Pl. 1, fig. 6.

Concentric grooves, broad, deep; dorsal keel undulated by the grooves extending over it. Length 10.5, breadth 5 mm. Off Neptune Islands, 104 fathoms. Very rare.

ATLANTIDAE.

Minute, spirally coiled in one plane, fragile, glassy, sides compressed, keeled throughout; protoconch dextral; aperture oval, narrow, deeply notched at the keel. Operculum sometimes present. Distribution—warm and temperate zones. Fossil—Silurian. The *Atlantas* inhabit the open ocean, generally in great numbers, swimming slowly with the foot uppermost. Unlike the *Carinarids*, the shell is capable of containing the whole animal which is carnivorous. The foot is divided transversely into two parts, the posterior part bearing an operculum with a sinistral coil (where present), while the anterior part forms a fin provided with a sucker. Sir J. C. Verco dredged an undetermined species 35 miles south-west of Neptune Islands, 104 fathoms, but so far we have been unable to find the specimens amongst his collection.

CYPRAEIDAE.

"Cowries." Ovate, varying from nearly cylindrical to almost pear-shaped; ventricose, convolute, smooth, highly polished and brilliantly coloured; spire nearly, if not entirely, covered by shelly matter deposited by the mantle on the thin immature shell which has a fairly prominent spire; aperture nearly central, narrow, longitudinal, with a short canal at each end; outer lip (of adult) thickened, inflected; lip and columella dentated, distinctly or obsoletely, the entire length. No operculum. Distribution—Tropical and subtropical, on reefs and under rocks at low water and beyond, feeding largely on coral animals. More than 500 species have been described. Fossil—Cretaceous. Young shells are *Bulla*-shaped, have a thin and sharp outer lip, a prominent spire, a thin periostracum, and are sometimes designated "*Paper-Shell-Cowries*" in allusion to the fragile structure. The mantle of the animal is furnished with a pair of side-lobes, which, in the adult, fold over the shell and almost meet above it. The glands of the mantle deposit a shining enamel over the whole shell, thickening it, and largely concealing the spire. When disturbed the mantle is retracted within the shell. There is usually a line of paler colour along the back indicating where the mantle-lobes meet. The animal has a short muzzle, a broad foot with a squarish front, and a long siphon. "Cowries" are carnivorous, feeding upon sponges, etc. Sexes are united in the same individual.

The name "Cowry" is derived from a Greek word meaning "a little pig." The hunched back and the slightly upturned snout probably suggests the name. The old English form was "Gowry," and in some parts of the British Isles it is the "Nun" or the

"Stickfarthing." The earlier scientific name was "Porcellana," from the Latin "porculus," a young pig or porker. The French name to-day is "pou de mer," "sea-louse." The beautifully glazed earthenware from China was said to resemble the polish on the "porculus", hence the word "porcelain." We have reversed the idea in describing the polish on a "Cowry" as porcelaneous. The scientific name, "Cypraea" is from "Cypris," a name of Venus, the shell sometimes known as "concha venerea," the "shell of Venus," on account of its beauty.

From ancient times the little "Money Cowry" (*Cypraea moneta*) and the "Ring Cowry" (*Cypraea annulus*) have been used as currency in West Africa and India, and were used in the slave trade in West Africa.

The large white "Poached Egg Cowry" (*Ovulum ovum*) is worn by the natives of New Hebrides and New Caledonia as a sign of high social rank, and the "Orange Cowry" (*Cypraea aurantia*) is used in a similar way in Tonga and Fiji.

CYPRAEA Linne 1758.

Ventricose, convolute, covered with shining enamel; spire concealed; aperture long and narrow; inner lip crenulated; outer lip inflected and crenulated. Type—*C. tigris* Linne 1758. The "Cowries" were formerly all referred to this genus but latterly many other genera have been set up, the distinctive characteristics of which are not infrequently difficult to explain.

C. TIGRIS Linne 1758.

"Tiger-Cowry." Ovate, ventricose, base flatly concave, teeth large; back whitish or yellowish, promiscuously painted with rather large blackish-blue clouded spots; base white, unspotted, canals oblique. Length 90, breadth 64 mm. The "Tiger-cowry" is but rarely taken in South Australia. The records are: 2 alive Kangaroo Island (Weir); 1 alive Outer Harbour (Walton); 1 dead Pelican Point (Trigg); 1 dead Kangaroo Island (Walker).

C. PANTHERINA Dillwyn.

Medium size, egg-shaped, rather ventricose, extremities slightly attenuated; whitish, besmeared with red and yellow; back profusely painted with brown or blackish-brown spots, sometimes clouded with blue; dorsal line rusty red, sides tinged with red or violet; aperture somewhat gaping anteriorly; teeth rather small, especially on the columellar side. Length 61, breadth 37 mm. North Arm (Port River) one, alive (Matthews).

NOTOCYPRAEA Schilder 1927.

Small, subcylindrically pyriform, rather narrow, attenuated anteriorly; back well rounded, not high; spire scarcely concealed; aperture long, rather wide, scarcely straight; columella slightly

thickened, concave in front; outer lip inflected, thickened; teeth equal, small, close, the whole length of the aperture; base somewhat convex; canals oblique, open, shallow. Type—*Cypraea piperita* Gray 1825. All our small "Cowries" are referred to this genus, and the adult shells (excepting *N. albata*) have numerous round dark spots on the margin, encircling the shell at the base, and may be absent or numerous at the ends. Identity is often difficult but on the beaches near Adelaide, *N. bicolor* in particular is frequently found.

N. PIPERITA Gray 1825 (*Cypraea*). Pl. 1, fig. 7.

"Peppered-Cowry." Variable, usually somewhat pyriform, sometimes narrow, elongate; polished, shining, light brown or cream with three or four narrow and sometimes discontinuous bands of flesh-colour across the back; margins white with numerous brown spots on the upper part, a blotch over the spire and on each side of the anterior extremity; many minute specks on the back; interior purplish-white. Length 24, breadth 14 mm. Common, general, beach, and down to 25 fathoms.

N. BICOLOR Gaskoin 1848 (*Cypraea*).

"Grange Cowry." More cylindrical than *N. piperita*. Shining, tints of orange flesh colour with three or four interrupted bands of darker; more or less irregularly spotted throughout, with darker spots on the margins. Length 27, breadth 15, height 12 mm. Common on beach, Gulf St. Vincent, Kangaroo Island to Fowler's Bay and down to 17 fathoms. When taken alive, place the shell in a safe position on a rock just beneath the surface of the water and observe how the mantle lobes expand over the back of the shell. The animal is a beautiful pale lemon colour.

N. SUBCARNEA Ancey M.S.S.

Similar to *N. piperita*, but uniform pale flesh colour, without indications of darker colour bands; base almost wholly white; numerous blurred brown dots on margin; lateral thickening, sub-angulated, projecting, shallowly channelled above; aperture rather wide and well bent towards left at posterior end; teeth white, small, blunt, rather spread over the base which is well thickened. Length 24, breadth 16 mm. Rare Beach, MacDonnell Bay, Lacepede Bay.

N. VERCONIS sp. nov. Pl. 1, fig. 8.

Formerly misidentified as *Cypraea angustata* Gmelin, a South African "Cowry." Small, solid, plump, ovately-pyriform, ventricose; dorsum unicoloured chocolate; base white; margins whitish with numerous small, smeared, dark-brown spots; spire not prominent, almost covered; right margin thickened; base convex; aperture rather large; teeth equal, small, close, continuous nearly the

whole length, about 27 on the right margin sloping into the aperture; on the columellar side the teeth point directly to the aperture and do not show on the base; outer lip sharply edged; inner lip rounded; columella somewhat concave anteriorly; canals oblique, open, shallow. Type—Length 29, breadth 21 mm. Gulf St. Vincent. (Reg. no. D.10173 S. Aust. Mus.). South Australia, general, uncommon. More common in Tasmania. Also taken at Albany, W.A. The colour may vary from pale yellowish-brown to deep chocolate with a bluish-white base. Closely related to *N. mayi* Beddome, which is banded.

N. DECLIVIS Sowerby 1870 (*Cypraea*).

More pear-shaped than *N. verconis*, more abruptly declining in front, and posterior end more deflected; base more convex; aperture straighter. Colour light-brown or pure white with crowded large dark brown spots along the columella side, smaller lighter peppered spots all over the back. Length 25, breadth 18, height 13.5 mm. McDonnell Bay. No bands are visible across the back in the adult.

N. COMPTONI Gray 1847 (*Cypraea*).

Less plump and more cylindrical than *N. verconis*; rich brown sometimes with two or three very faint continuous bands; margins with numerous dark-reddish spots. Length 24, breadth 15 height 11 mm. Fairly common, all round the South Australian coast, alive in rock pools just beyond low water, and dredged to 14 fathoms. Much more common than *N. verconis* for which it is often mistaken. There is also a pure white form, and one of cream colour slightly tinged with brown; these may or may not have reddish-brown spots on each margin, very minute brownish specks on the back and faint brown bands in addition. The animal is bright orange.

N. MAYI Beddome 1897.

Size and shape much like *N. comptoni*. Rich orange or dull salmon; two or three brown bands, continuous or interrupted; base white or light orange. Length 26, breadth 17, height 13.5 mm. Ocean beaches MacDonnell Bay to Venus Bay and Albany. Not in Gulf St. Vincent and Spencer Gulf.

N. ALBATA Beddome 1898.

Broader than *N. comptoni*; snow white, without any spots on margins; three slightly raised lines across and a groove along the back; teeth very fine especially on the columellar side. Height 25, breadth 18 mm. Rarely taken in Gulf St. Vincent. May not prove to be a distinct species but an albino form.

LURIA Jousseaume 1884.

Egg-shaped, back rounded, base flattened; anterior extremity broad, bilobed; spire covered by enamel; aperture somewhat sinuous, dentated; anterior fossette at the margin of columella not accentuated. Type—*Cypraea lurida* Linne.

L. REEVEI Gray 1837. Pl. 1, fig. 9.

Medium size, thin, ventricose; back yellowish or lavender-brown, obscurely four banded, base whitish, extremities and apex of spire pink; spire rather prominent; teeth small, thin, numerous, rather conspicuous across the columella. Length 38, breadth 27 mm. Spencer Gulf west to Western Australia.

ZOILA Jousseaume 1884.

Egg-shaped, base flat, back rounded, gibbous; spire prominent; aperture sinuous, somewhat dilated in front; columellar margin less dentated than the outer lip; columellar concavity broad, flat, smooth. Type—*Cypraea scotti* Broderip.

Z. SCOTTI Broderip. Pl. 1, fig. 12.

Large medium size, oblong boat-shaped, extremities produced and turned upwards; pale ashy-blue clouded with yellowish-brown; sides and base very dark brown; aperture narrow; teeth small, nearly obsolete on columellar side. Length 85, breadth 47 mm. Yorke Peninsula, one example (Matthews).

Z THERSITES Gaskoin 1848. (*Cypraea*). Pl. 1, fig. 10.

"High-backed Cowry," "Black Cowry," "Paper Shell Cowry" (juvenile). Rather large, very gibbous, back high and humped, depressed over both anterior and posterior extremities; heavily splashed on the back with dark reddish-brown with cream between; entire circumference of base nearly black, teeth white; centre of base frequently white; a curved whitish mark in the depression over both extremities; teeth distinct, even, about 27, extending but slightly over the outer lip; on the columellar side, a few teeth only at front-end; columellar furrow broad; flat, not extending beyond the more prominent teeth. Length 72, breadth 51, height 41 mm. Black Point (Gulf St. Vincent), Port Victoria, Port Lincoln, Hardwicke Bay, American River, also in 40 fathoms off Beachport. Not recorded from Victoria, Tasmania or Western Australia. Found on sponges in a few feet of water and taken in long-handled nets. The "Black Cowry" is the same shell with very dark or jet-black colouring. The "Paper Shell Cowry" is the immature form, which may be as large as some adults, thin, rather more pear-shaped, spire distinct, outstanding; colour yellowish with or without brown spots, splashes and cross-bands, outer lip inflected and without teeth.

UMBILIA Jousseaume 1884.

Egg-shaped, extremities prominent, base somewhat flattened, back rounded; spire visible at bottom of deep cavity (umbilicus-like); aperture sinuous, somewhat dilated in front, margins of aperture dentate; columellar fossette small. Type—*Cypraea umbilicata* Sowerby 1825.

U. ARMENIACA Verco 1912 (*Cypraea*). Pl. 1, fig. 11.

Rather large, solid, high-backed; whitish, heavily clouded and blotched by light yellowish-brown and scattered chestnut spots; base rich apricot; left side of body whorl faint lilac; well marked umbilicus in which the volutions are plain; spiral bands, faint, narrow on right side of back; aperture rather wide, much curved posteriorly and turning up behind forming well marked notch; outer lip with 38 small teeth; columellar margin with 39 teeth, narrow, short; base convex, prolonged, thickened and expanded on each side in front. Length 100, breadth 66, height 57 mm. Great Australian Bight, 80 miles west of Eucla, 100 fathoms. Owing to the proximity to South Australia it is described and figured here though no specimen has been taken in South Australia up to the present. The species found in Victoria and Tasmania is different and bears the name *U. hesitata* Iredale. (= *umbilicata* Sowerby).

TRIVIIDAE.

Cowry-shaped, usually small; ridges numerous across the back, frequently marked by a depression running lengthwise; whorls of spire concealed by a thin outside covering, somewhat transparent; anterior canal short, wide, and slightly turned up; front of columella concave, ribbed; no operculum. Distribution—warm seas. Fossil—Tertiary. As with the *Cypraeidae* the mantle lobes almost meet on the back of the shell. Carnivorous; specimens frequently get into crab-pots. Sexes united in the one individual.

ELLATRIVIA Iredale 1931.

Oval, slightly narrowed in front, shining; ridges numerous, close, rounded, transverse, all over the shell above and below, interrupted on the dorsal surface by an impressed median line; protoconch of about two smooth, convex, whorls, scarcely visible through the thin glaze; aperture curved at both extremities; columellar furrow well defined anteriorly. Type—*Triviella merces* Iredale 1924.

E. MERCES Iredale 1924. (*Triviella*) (*Trivia australis* Lamarck 1822 preocc.). Pl. 1, fig. 13.

Rather small, thin; pinkish-white, with a few light brown spots of various sizes on the back; extremities tinted with rose, base white; spire seen as a bump overlaid by the spiral body sculpture which consists of narrow smooth ridges; an impressed dorsal line indicates where the mantle lobes meet; about 30 ribs denticulate the outer lip and about 20 the inner lip, extending across the columellar deep anterior groove. Length 15, breadth 11 mm. Not uncommon. General, beach to 200 fathoms.

LACHRYMA Humphrey M.S.S. (*Erato* Risso 1826).

Oval, narrowed in front; spire short, conical, distinct; aperture rather straight; outer lip without varix, but thickened towards the middle and denticulated within; columella with distinct plaits anteriorly. Type—*Lachryma trifasciata* Humphrey M.S.S.

L. TRIFASCIATA Humphrey M.S.S. (*Erato lachryma* Gray 1832). Pl. 1, fig. 14.

Small, pear-shaped, slightly produced anteriorly; whitish, lip faintly roseate, obscurely three-banded with rose; smooth; spire rather prominent; mouth slightly sinuate; outer lip finely dentate; inner lip faintly dentate anteriorly. Height 6, diam. 4 mm. Not common. General, beach to 200 fathoms.

L. BIMACULATA Tate 1878. (*Erato*).

Small, pear-shaped, smooth, shining; yellowish-white, brownish-red at each extremity; base somewhat constricted; outer lip with about 25 strong, transverse dentations; columella with 8 crowded transverse plaits. Length 4, breadth 3 mm. Gulf St. Vincent. Spencer Gulf. Beach to 30 fathoms, not common.

AMPHIPERATIDAE.

Somewhat cowry-shaped; medially ventricose, attenuated, somewhat pointed at both ends and more or less prolonged into canals; outer lip thickened, inflected; lips dentated or smooth. Distribution—Tropical and subtropical. Fossil—Tertiary. Shells of this family have not the rich and varied colours of the "Cowries" and are distinguished from them by the drawn-out ends. Animal with narrow foot, adapted for creeping on the narrow, rounded branches of *Gorgoniae* and corals, on which it feeds. The large white "Poached-egg" shells of the Pacific belong to this family.

PROSIMNIA Schilder 1925.

Small, elongate, back angulated above the middle; outer lip dentate; columella dentate above. Type—*Ovula semperi* Wein-kauf (Borneo).

P. VERCONIS sp. nov. Pl. 1, fig. 15.

Not *Ovula formosa* Adams & Reeve (Borneo). Shell small, solid, convolute, produced at both ends; white, with dorsum rose, and faint fuscous tint at both extremities; transverse incision-striae, close set, well marked over posterior third, and crinkled by somewhat irregular growth lines; aperture posteriorly slightly curved to left ending in a lateral notch, anterior two-thirds nearly straight, continued into a well marked sub-effuse notch; outer lip somewhat thickened dorsally, acutely, widely, flatly inflected, dentate ventrally, slightly excavated behind anterior notch, produced into a rounded callous end behind the posterior notch, then continued obliquely as a subacute ridge beyond the end of the spire of four whorls, slightly convex, completely covered with callous. The inner lip, in front of notch; inner lip wide, spread over base of body-whorl which is flatly rounded in upper half, and flatly excavated in lower half. Type—Length 11, breadth 4.5 mm. 35 fathoms off St. Francis Island. (Reg. no. D.10174 S. Aust. Mus.). Distribution—Gulf St. Vincent and St. Francis Island. Very rare, only 3 specimens.

VOLUTIDAE.

“Volutes.” Usually large, elongate, more or less oval; spire relatively short; protoconch variable; whorls numerous, mouth elongate, sometimes widened, truncated and often deeply notched below; outer lip generally thick, more or less straight; columella callous, obliquely twisted below, and ending in a point usually lower than the extremity of the outer lip; columellar folds variable; usually 3 to 5, very oblique, thin and unequal, or thick, almost horizontal and nearly equal; inner lip more or less thick, usually spreading over the base; operculum but rarely present. Distribution—Australasia, Indian and Pacific Oceans (mainly in the Southern Hemisphere). Fossil—Cretaceous. Animal with a broad foot, head flattened and widened; the eyes on the sides; tentacles wide apart; siphon recurved. Most “Volutes” live in the shallow coastal waters but some have been dredged at 1,600 fathoms.

The “Volutes” are conspicuous and showy, many are rare, and much sought after by collectors. Rarely taken alive because as the tide recedes they bury themselves in the sand like the *Naticae* and can only be obtained by digging. Violent storms sometimes throw them on the beach alive.

AMORENA Iredale 1929.

Elongately ovate, smooth, polished; spire short, conical, protoconch horny about four whorls, rather tall, conical, pointed, slightly oblique; columellar folds four, well developed, oblique with a fifth less developed, below the uppermost. Type—*Voluta undulata* Lamarck. Differs from *Amoria* Gray (a tropical group) in form, protoconch and columellar folds.

A. UNDULATA Lamarck 1804 (*Voluta*). Pl. 2, fig. 1.

Rather large, thick, solid; rusty or ivory-white with numerous conspicuous, longitudinal, flexuous, chestnut lines; columella and interior bright red-orange; adult whorls four, smooth, slanting round the upper part, then somewhat angulated; mouth elongate; outer lip expanded, slightly thickened, channelled above, notched below; columella with four strong folds. Height 80, diam. 40 mm. Rather common. General on sand banks; also Victoria and Tasmania.

A. EXOPTANDA Sowerby 1849 (*Voluta*). Pl. 2, fig. 2.

Large, olive-shaped, thick; pale rose-orange, with crowded, sharply waved, fine chestnut lines; columella and interior orange; whorls slanting round the upper part then somewhat angulated, gradually attenuated; mouth narrow, outer lip scarcely thickened; columella strongly four folded. Height 105, diam 48 mm. Common. Murray Mouth to Port Lincoln. Taken alive in lobster pots Victor Harbour. Frequently inhabited by hermit crabs. Appears restricted to South Australian waters.

NOTOPEPLUM Finlay 1926.

Elongately-ovate; protoconch small, about two whorls, polished, almost flat on top, faintly roughened initially; columella four folded; outer lip simple, thin, wrapped squarely above over the body whorl. Type—*Scaphella victoriensis* Cossmann, a Balcombian fossil (Victoria). This genus is the most highly enamelled of the Austral "Volutes."

N. TRANSLUCIDUM Verco 1896 (*Voluta*). Pl. 2, fig. 9.

Very thin, translucent, smooth, glistening; a narrow spiral reddish-brown line close beneath the suture; axial, narrow, curved reddish-brown lines, about 16 in body whorl, composed of minute zigzags or of small spirally elongated spots; two indefinite spiral colour bands encircle the whorl; adult whorls four, slightly convex; mouth narrowed above by the fold of the outer lip, dilated below, basal notch wide, shallow; outer lip thin, convex; columella with four folds. Height 40, diam. 16 mm. Rare. Backstairs Pasasge, Newland Head; Yatala Shoal, 6-22 fathoms.

NANNAMORIA Iredale 1929.

Small, elongately oval; nodules numerous, on shoulder of last whorl and on preceeding two whorls; spire pointed, less than half the length of the mouth; protoconch of three whorls, smooth, regular; outer lip thickened but not varicose; columellar folds six, three large alternating with three smaller. Type—*N. amacula* Iredale 1929.

N. ADCOCKI Tate 1888. (*Voluta*). Pl. 2, fig. 3.

Small, yellowish-white, with wavy, narrow, chestnut, spiral lines; two narrow chestnut spiral bands on body whorl; a spiral row of elongate tubercles on periphery; mouth oval-elongate; outer lip thickened internally bevelled off to a fine edge; columella with four folds, oblique, increasing from below upwards. Height 53, diam. 25 mm. Not common. Middleton to St. Francis Island.

N. GUNTHERI E. A. Smith. (*Voluta*).

Small; yellowish-white with rather close set axial brown lines, angled forward at the tubercles, and backwards a little below the tubercles; angled just above sutures and in posterior part of the body-whorl; no spiral colour lines. Other details much like *N. adcocki*. Height 38, diam. 17.5 mm. Uncommon. Middleton. Also Western Australia. May prove to be only a variant of *N. adcocki*.

PTEROSPIRA Harris 1897.

Large; axial ridges numerous, dieing out in the upper part of the last whorl; spire elevated, about one third the height of the shell; protoconch large, mammillate, very oblique; adult whorls shouldered, somewhat coronate; mouth broad; outer lip thickened, reflexed; columella with 3 folds, not large, rounded, oblique. Type—*Voluta hannaforði* McCoy.

P. ROADNIGHTAE McCoy 1881. (*Voluta*). Pl. 2, fig. 5.

Large, oval; pale yellowish, with numerous, axial, oblique, zigzag, reddish-brown lines and sometimes a spiral white band; base spirally striate; adult whorls 4, convex; outer lip thickened above; columella with 3 folds, rather small. Height 214, diam. 105 mm. Dredged off South Australian coast (Dannevig), also Victoria, Tasmania and 40 miles west of Eucla.

ALCITHOE H. & A. Adams 1858.

Large, ovately spindle-shaped; spire elevated, conic; protoconch bulbous; larger than the succeeding whorl, sometimes ribbed; body-whorl large, swollen at the middle, attenuated and excavated at the base; mouth oval-elongate with a channel above,

but little narrowed below, broadly truncated and excavated; outer lip dilated, subreflexed, nearly vertical, smooth inside, cut away towards the suture; columella with 3 to 7 folds, equidistant, thick, lightly recurved below, and ending in a pointed beak; inner lip thin, spreading broadly over body whorl. Type—*Voluta arabica* Martyn 1784. (New Zealand).

A. NODIPLICATA Cox 1910. (*Scaphella dannevigii* Verco 1912). Pl. 2, fig. 4).

Large, thin, polished; dark chestnut brown, faintly, minutely, spirally, crowdedly, flecked with white, with scattered darker brown blotches, the tips of the tubercles blackish-brown; narrow creamy band winds round body whorl to middle of outer lip; spiral lirae, crowded, fine wavy, about 20 above the shoulder; tubercles, about 11 on a whorl, coronate the shoulder; adult whorls 3, sloping, slightly convex; body-whorl large, narrowed below; suture minutely channelled; columella slightly concave, three very oblique folds. Height 163, diam. 83.3 mm. Rare. Newland Head to Rottneest Island.

A. KREUSLERAE Angas 1865. (*Voluta*). Pl. 2, fig. 6.

Medium size; pale reddish-yellow, with three bands of orange-brown maculations; plicately nodulous on angulations; spire turreted, one third length of shell; whorls smooth, angulated in the middle, outer lip simple; columella scarcely straight, 4 folds. Height 90, diam. 40 mm. Not common. Taken alive in lobster pots Encounter Bay.

A. VERCONIS Tate 1892. (*Voluta*). Pl. 2, fig. 7.

Small, thin; whitish; with intricate, linear, reddish markings, chestnut spotted around the early sutures and on body-whorl; axial grooves, faint, spiral striae numerous, wavy; spire one third of total length, turreted; adult whorls $3\frac{1}{2}$, early ones angulated below the middle and nodulous on the angulations; body-whorl with 10 nodosities on the periphery; outer lip thickened, bevelled inside to a simple edge; columella with 4 folds. Height 34, diam. 15 mm. Uncommon. Gulf St. Vincent to the westward, 13-30 fathoms.

ERICUSA H & A. Adams 1858.

Large, oval, smooth; spire elevated, conic; protoconch rather large, mammillate, oblique, initial whorl dark coloured; adult whorls convex, slightly angulated above, not coronated; suture simple; mouth rather broad, channelled above, not deeply notched below; outer lip slightly sinuous, thickened, reflexed; columella with 3 folds, oblique, not very prominent. Type—*Voluta fulgetrum* Sowerby 1825.

E. FULGETRUM Sowerby 1825. (*Voluta*). Pl. 2, fig. 9.

Large, very variable in size, solid; yellowish-flesh colour with axial zigzag brown dashes which tend to two spiral rows of blotches, one just below the shoulder and the other over the lower part of the body whorl; the blotches roughly crescentic or arrow-headed, with their concavity towards the outer lip; at the suture the markings are flame-like. Height 125, diam. 60 mm. Very variable in size, a mature shell may only measure 75 x 37 mm. Rather common, Lacepede Bay to Gulf St. Vincent and Spencer Gulf. Not recorded from Victoria, Tasmania or Western Australia. Alive on sandbanks which are covered by about 18 in. of water at low spring tide. Taken alive from lobster pots at Victor Harbour. There are several colour varieties from the same location as the species. var. *LUNULISLIGATA* Verco 1912. Two spirals of large crescentic or arrow-headed spots, with flames at the suture. var. *PUNCTISLIGATA* Verco 1912. Two spirals of small spots the size of peppercorns. var. *CONNECTENS* Verco 1912. The axial lightning zigzags may be crossed by two continuous deep purple-brown bands, one below the shoulder, the other over the lower part of the volution. var. *BICINTA* Verco 1912. The only colour ornament may be these two bands and some small flames at the suture, all the axial markings being absent. var. *TRICINTA* Verco 1912. The subsutural flames may unite to form a third spiral band. var. *UNICINTA* Verco 1912. Only the lower spiral band may be present, but this quite valid. var. *ALBA* Verco 1912. There may be no colour markings, the shell being pure white. var. *DICTUA* Verco 1909. Covered with a fine network of light yellowish-brown with only a few small spots on the first and second spire-whorls.

E. PAPILLOSA Swainson. (*Voluta*). Pl. 2, fig. 8.

Large, solid, smooth; orange-yellow, netted and banded with yellowish-chestnut; columella showing 3 folds heaped together, a very small fold above the three, and a distinct one close to and almost forming the border of the canal. Height 110, diam. 58 mm. Not common. Beach, Victor Harbour to 120 miles west of Eucla. 100 fathoms.

MELO Humphrey.

"Boat Shell," "Baler Shell." Large, subovate, ventricose, thin, spire depressed; protoconch about $3\frac{1}{2}$ whorls, turbin ate, globose, wider than high, white; adult whorls smooth, the last posteriorly coronated; mouth oval-elongate, wide; anterior notch wide, rather deep; outer lip simple, acute; columella with numerous folds, strong, oblique. Type—*Melo tessellata* Lamarck.

M. MILTONIS Gray 1833. (*Voluta*). Pl. 2, fig. 11.

Narrow elliptic, moderately thick; yellowish-brown with many white triangles; axial riblets, numerous, distinct or obsolete;

growth striae distinct; periostracum persistent; spire slightly elevated; adult whorls coronated with incurved spines of moderate length; mouth rather oblong; outer lip scarcely curved; columella with 4 distinct folds (rarely with only 3). Height 230, diam. 136 mm. Uncommon, Streaky Bay to Swan River, beach to 100 fathoms. Taken alive at Fowler Bay. From *Melo diadema*, the common "Baler Shell" of the Barrier Reef, our shell is much smaller, narrower, more cylindrical, and the coronate spines incurved. A tropical group, probably a survivor from the time when our climate was much warmer.

LYRIA Gray 1847.

Rather small, ovoid, thick; axial ribs strong; spire conical, elevated; protoconch of about 2 whorls, initial whorl a lateral blob, oblique, second whorl convex, smooth; body-whorl regularly convex; fasciole well marked; mouth channelled above, deeply notched below; outer lip thickened with an external varia; columella with 3 almost horizontal folds, above which are several weak wrinkles. Type—*Voluta nucleus* Lamarck.

L. MULTICOSTATA Broderip 1827. (*Voluta mitraeformis* Lamarck preocc.). Pl. 2, fig. 12.

Flesh colour decorated with numerous dark brown squarish patches and spirally with rather crowded broken lines of reddish-brown which tend to form broad interrupted bands; axial ribs numerous, prominent rounded; spirally striate on the base; adult whorls 5, convex, shoulder slightly shelving; suture deep. Height 60, diam. 26 mm. Common, general. Alive on sandbanks near low tide mark at Outer Harbour.

OLIVIDAE.

Smooth, polished, porcellaneous, without periostracum, somewhat cylindrical or barely spindle shaped; mouth oblong, notched at the base; inner lip, sutures, and spire more or less covered with a callous deposit; columella more or less plicate; operculum horny, present or absent. Distribution—Australasia, Indian, Pacific and Atlantic Oceans. Fossil—Cretaceous. The "Olives" almost rival the "Cowries" in their brilliant colouring and porcelain-like polished surface. The "Cowries" thicken the shell at maturity by an external deposit of enamel, but the shell layers of the "Olives" are simultaneously produced at all stages of growth. The interior volutions are often absorbed till they become of paper-like tenuity in order to accommodate the increasing bulk of the animal. Animal with a very large foot, in which the shell is half immersed; mantle lobes large usually meeting over the back of the shell; foot divided anteriorly by a transverse groove, the fore part extended beyond the head; eyes, when present, on the middle of the tentacles; siphon recurved. Mostly

burrowing in sand; from low water to moderate depths. Carnivorous.

OLIVA Bruguiere.

"Olives." Scarcely cylindrical; spire short, conic; suture channelled; mouth long, narrow, widely notched below; columella obliquely plicate, grooved or striate in front, callous behind (above): outer lip simple, no operculum. Type—*Olivia erythrostoma* Lamarck.

O. AUSTRALIS Duclose 1835. Pl. 2, fig. 13.

Small, polished; whitish or yellowish, with brown markings beneath the sutures, a brown streak on the fasciole from the notch obliquely to the inner lip, and sometimes half a dozen narrow, violet-brown axials, extending to the suture above; brown spots on body-whorl, small, tending to form axial zigzags; spire elevated; protoconch of about 3 whorls, pure white, rounded, smooth, polished, the initial whorl oblique; adult whorls 5, flatly concave, last elongate, narrow, slightly convex, columella plicate above, obliquely grooved below. Height 27, diam. 12 mm. General, beach to 30 fathoms. Very common on Snowden's Beach, Outer Harbour. This is the only true "Olive" in South Australia.

BARYSPIRA Fisher 1883.

Elongately oval; axial growth lines, fine, crossed by dense spiral striae; spire short, the whole length covered by a thick callus; protoconch pointed, smooth, mostly hidden by enamel; adult whorls numerous, last flatly convex; suture hidden by enamel; mouth high, moderately broad, angled and canaliculate above, deeply notched below; outer lip thin, often with a minute tooth below at upper margin of fasciole; columella with several oblique folds below; inner lip thick, narrow, separated by a deep groove from the well marked fasciole which is somewhat excavate and more or less angularly plicate. Type—*Ancilla australis* Sowerby 1830 (New Zealand).

B. MARGINATA Lamarck 1810. (*Ancillaria*). Pl. 2, fig. 14.

Medium size, solid; shining white or yellowish, with a spiral white band blotched with brown below the suture, another row of brown blotches above the fasciole, and a third on the fasciole; spire blotched with brown; growth lines fine, crossed by equally fine spirals; whorls 6, slightly shouldered, two-ribbed. Height 40, diam. 34 mm. General, not common.

B. EDITHAE Pritchard & Gatliff 1898. (*Ancilla*). Pl. 2, fig. 15.

Medium size, fairly solid; creamy-white with a broken brown band immediately above the basal groove; enamelled grooves coloured similarly with dashes; zigzag lines, light brown on body-whorl between the bands; axially and spirally finely striate, columella callosity starting a little below the centre of mouth, extend-

ing across the body and penultimate whorls; adult whorls 5, with four or five distinct spiral grooves; body-whorl more than half the total length; basal groove terminates in a very slight projection of the outer lip; mouth narrow, lanceolate, with a well defined sinus above. Height 18, diam. 7 mm. General, not common. Beach to 22 fathoms.

B. PETTERDI Tate 1893. (*Ancillaria*). (*Ancularia obtusa* Petterd 1885).

Small, thick; shining, white to pale reddish-brown; body-whorl margined above and below with a broad milky zone, and lined at the base; spire lined, short, swollen, rounded, caused by its rather thick deposit of enamel; protoconch obtuse, blunt, mouth long, narrow; columella with a thick layer of enamel extending on to the body-whorl, wrinkled and twisted at the basal notch. Height 20, diam. 10 mm. South-east of South Australia. Rare. From its small size it may be mistaken for a stunted form of *B. marginata*.

B. MONILIFERA Reeve 1864. (*Ancillaria*).

Small; shining white, netted with orange-brown, sutures and base neatly encircled with orange-brown spots; smooth; spire rather elevated; mouth small; columella callous, twisted. Height 15, diam. 7 mm. General, rare. 17-20 fathoms.

B. BEACHPORTENSIS Verco 1909. (*Ancilla*).

Small, solid, oval; bluish-grey tint, callus milk-white; four spiral grooves on body-whorl, three approximate and one distant, with faint axial and spiral scratchings between these grooves; spire of four whorls, slightly convex, completely covered with callus, the sutures indicated by shallow furrows, between which are 3 low, broad, spiral ridges; protoconch mammillate; mouth triangularly-oval, truncated below and widely notched; outer lip with callous thickening above and a tooth below; columella with 6 oblique, curved folds. Length 20.5, diam. 9.5 mm. Beachport 100-150 fathoms. Probably a deep water form of *B. petterdi*. *CUPIDOLIVA* Iredale 1924.

Obliquely elongate-oval, smooth; protoconch pancispiral, blunt, oblique; suture channelled; mouth oval, with a linear gutter posteriorly, widely open in front, truncate, and broadly notched; inner lip glazed from suture to base. Type—*Olivella nympha* Adams & Angas 1863). Pl. 2, fig. 16.

C. SOLIDULA Verco 1909 (*Olivella*) (not *Olivella nympha* Adams & Angas 1863). Pl. 2, fig. 16.

Small, solid, shining white; smooth; spire elevated, whorls 4, sloping convex; suture well channelled; mouth triangular-oval, contracting gradually to a linear gutter above; outer lip simple, smooth. Height 6, diam. 2.3 mm. General, 22-25 fathoms.

RAMOLIVA gen. nov.

Small, obliquely elongate-oval; smooth; spire elevated, conic, rather less than half the height of the shell; protoconch paucispiral, blunt, oblique; adult whorls few, flatly convex; suture linear, not canaliculate; mouth oval, narrowed above, widely open below, shallowly notched; outer lip ascending at the suture, simple; columella without folds. Type—*Olivella adiorygma* Verco 1909. Differs from *Baryspira* in the absence of a canaliculate suture.

R. ADIORYGMA Verco 1909. (*Olivella*). Pl. 2, fig. 17.

Small, solid; white; smooth; adult whorls about 3, flatly convex; suture linear; outer lip simple, bevelled inside; inner lip a glaze over the columella. Height 5.3, diam. 2.3 mm. Gulf St. Vincent and Backstairs Passage 17 fathoms.

CANCELLARIIDAE.

“Cross-barred Shells.” Egg-shaped, often turreted; generally cross-barred; spire elevated; protoconch about $1\frac{1}{2}$ whorls, globular, smooth; adult whorls slightly convex, often shouldered; suture deep, sometimes canaliculate; mouth triangularly-oval, sometimes channelled above, a short, wide, open canal below; outer lip rather thick, usually crenate or toothed inside; columella more or less concave, with 2 or 3 strong folds, the lowest often absorbed in the twist of the columella; no operculum. Distribution—Australasia, West Indies, Mediterranean, West Africa, India, China, West Coast of tropical and South America. Fossil—Upper Cretaceous. Animal with small foot, short siphon, snout short, eyes at the outer bases of the tentacles. Vegetable feeders; found at low water and moderate depths.

CANCELLARIA Lamarck 1799.

Egg-shaped; cross-barred or ribbed; last whorl ventricose; mouth somewhat oblong, basal canal short, sometimes recurved; columella folds strong. Type—*Cancellaria cancellata* Linne.

C. UNDULATA Sowerby 1848 (not *Cancellaria australis* Sowerby 1832). Pl. 3, fig. 2.

Medium size, solid, gradated; fulvous-fawn, obscurely banded; axial ribs, rather prominent, numerous, faintly noduled at the angle, crossed by many faint spiral grooves; adult whorls, about 4, flattened at the upper part; basal canal short, slightly recurved; columella with 3 folds. Height 41, diam. 25 mm. General, fairly common on beaches.

C. LACTEA Deshayes (= *C. laevigata* Sowerby 1841). Pl. 3, fig. 3.

Small, oblong-ovate, thin; cream colour; axially, faintly plicate, and spirally, finely, linearly, grooved; spire rather obtuse, whorls flatly convex, rounded at the upper part; mouth oval, interior ridged; columella arched, with 3 strong folds. Height 30, diam. 18 mm. Not common.

C. SPIRATA Lamarck 1822. (*C. excavata* Sowerby 1849). Pl. 3, fig. 4.

Medium size, solid, gradated, minutely superficially umbilicated; white, tinted flesh color, encircled with orange-red spots at the angles; axial ribs not prominent, numerous, crossed by many faint spiral grooves, more plainly spirally striated on base; spire rather short; suture deeply excavated; mouth ridged within; columella with 3 strong folds and one or two incomplete. Height 56, diam. 22 mm. General, beach, rather common. The shorter spire, less prominent ribs, spiral ridges within the mouth and the minute umbilicus distinguish it from *C. undulata*.

C. PURPURAEFORMIS Kuster. (*C. tasmanica* Tenison-Woods 1875; *C. maccoyi* Pritchard & Gatliff 1899; *C. paludinaeformis* Valenciennes).

Small, narrow; white; spiral grooves, numerous, slender; growth lines indistinct, spire elevated; whorls not shouldered above; suture impressed; outer lip thin, litrate within; columella three-folded. Height 22, diam. 11 mm. General, uncommon.

C. GRANOSA Sowerby 1841.

Somewhat similar to *C. undulata* but differs in having a shorter spire and granose ribs. One specimen taken in Troubridge Shoal. More common in Tasmania, north and east.

OAMARUIA Finlay 1924.

Egg-shaped; reticulate sculpture of strong spiral and axial ridges; peripheral keel strong; spire rather short; protoconch one whorl, oblique; body-whorl inflated, shoulder smooth, wide; canal short, truncated; columella, slightly flexed to left below, with 3 folds. Type—*Admete suteri* Marshall & Murdoch 1920, a fossil, New Zealand Tertiary. To this genus also is referred the fossil, *Cancellaria tatei* Cossmann, = *gradata* Tate.

O. PERGRADATA Verco 1904. (*Cancellaria*). Pl. 3, fig. 5.

Small, solid; uniform dark chestnut-brown; axial lamellae numerous, crossed by numerous, rounded, spiral cords which are coronate at the angle of the whorls; a tuberculate spiral lira beneath the suture; protoconch of $1\frac{1}{2}$ turns, apex imbedded, smooth, light horn color; adult whorls $3\frac{1}{2}$, sharply angled; body-whorl obliquely, roundly, pyramidal; mouth narrow, square above, with a moderate size notch below; columella with two oblique folds. Height 10, diam. 5 mm. Gulf St. Vincent, Backstairs Passage, 17-22 fathoms. Rare.

O. PERGRADATA PROFUNDIOR Subsp. nov.

A deep water form of *O. pergradata*, in which the axial lamellae are suppressed so that the tubercles seen on the axials in the species are here absent, and the coronation of the angle of the whorl is very slight. Type, height 8, diam. 4 mm. Off Beachport, 200 fathoms. (Sir J. C. Verco). Reg. no. D.10175 S. Aust. Mus.

EXPLANATION OF PLATES.

PLATE I.

- Fig. 1. *Ianthina violacea* Bolten.
Fig. 2. *Naricava vincentiana* Angas.
Fig. 3. *Naricava flindersi* sp. nov.
Fig. 4. *Onustus perionianus* Iredale.
Fig. 5. *Naricava kimberi* Verco.
Fig. 6. *Carinaria australis* Quoy & Gaimard.
Fig. 7. *Notocypraea piperita* Gray.
Fig. 8. *Notocypraea verconis* sp. nov.
Fig. 9. *Luria reevei* Gray.
Fig. 10. *Zoila thersites* Gaskoin.
Fig. 11. *Umbilia armeniaca* Verco
Fig. 12. *Zoila scotti* Broderip.
Fig. 13. *Ellatrivia merces* Iredale.
Fig. 14. *Lachryma trifasciata* Humphrey.
Fig. 15. *Prosimnia verconis* sp. nov.

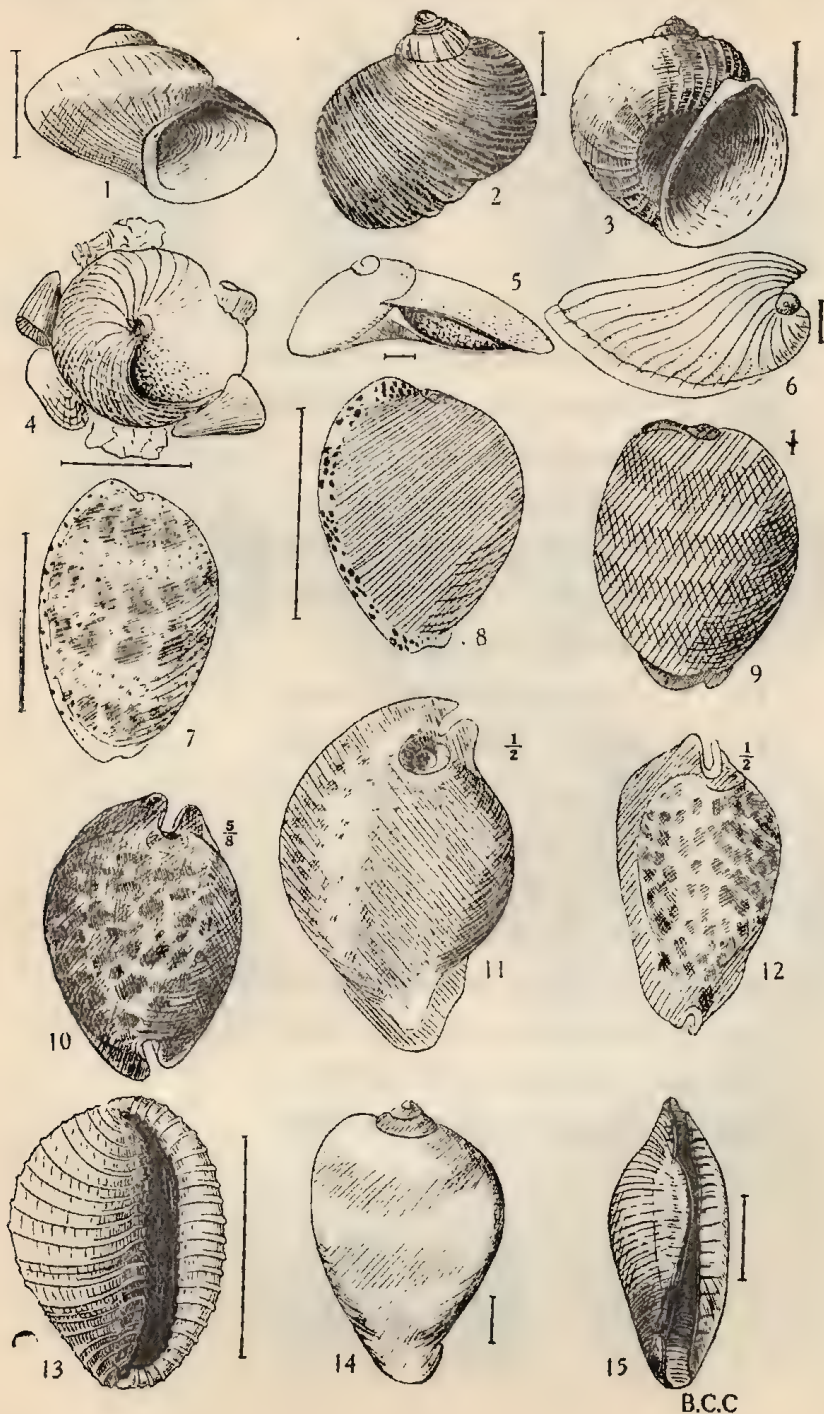


PLATE II.

- Fig. 1. *Amorena undulata* Lamarck.
- Fig. 2. *Amorena exoptanda* Sowerby.
- Fig. 3. *Nannamoria adcocki* Tate.
- Fig. 4. *Alcithoe nodiplicata* Cox.
- Fig. 5. *Pterospira roadnightae* McCoy.
- Fig. 6. *Alcithoe kreuslerae* Angas.
- Fig. 7. *Alcithoe verconis* Tate.
- Fig. 8. *Ericusa papillosa* Swainson.
- Fig. 9. *Ericusa fulgetrum* Sowerby.
- Fig. 10. *Notopeplum translucidum* Verco.
- Fig. 11. *Melo miltonis* Gray.
- Fig. 12. *Lyria multicostata* Broderip.
- Fig. 13. *Oliva australis* Duclos.
- Fig. 14. *Baryspira marginata* Lamarck.
- Fig. 15. *Baryspira edithae* Pritchard & Gatliff.
- Fig. 16. *Cupidoliva solidula* Verco.
- Fig. 17. *Ramoliva adiorygma* Verco.



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B.C.C.

PLATE III.

- Fig. 1. *Austroharpa punctata* Verco
Fig. 2. *Cancellaria undulata* Sowerby.
Fig. 3. *Cancellaria lactea* Deshayes.
Fig. 4. *Cancellaria spirata* Lamarck.
Fig. 5. *Oamaruia pergradata* Verco.
Fig. 6. *Acuminia brazieri* Angas.
Fig. 7. *Terebra albida* Gray.
Fig. 8. *Pervicacia kieneri* Deshayes.
Fig. 9. *Gradaterebra scalariformis* sp. nov.
Fig. 10. *Euterebra inconspicua* Pritchard & Gatliff.
Fig. 11. *Parviterebra brazieri* Angas.
Fig. 12. *Floraconus anemone* Lamarck.
Fig. 13. *Mamiconus superstes* Hedley.
Fig. 14. *Parviconus rutilus* Menke.
Fig. 15. *Fasciolaria australasia* Perry.
Fig. 16. *Colus australis* Quoy.
Fig. 17. *Propefusus undulatus* Perry.
Fig. 18. *Altivasum flindersi* Verco.
Fig. 19. *Propefusus undulatus profundior* subsp. nov.
Fig. 20. *Berlysma grandis* Gray.
Fig. 21. *Microcolus dunkeri* Jonas.
Fig. 22. *Latirofusus pulleinci* Verco.

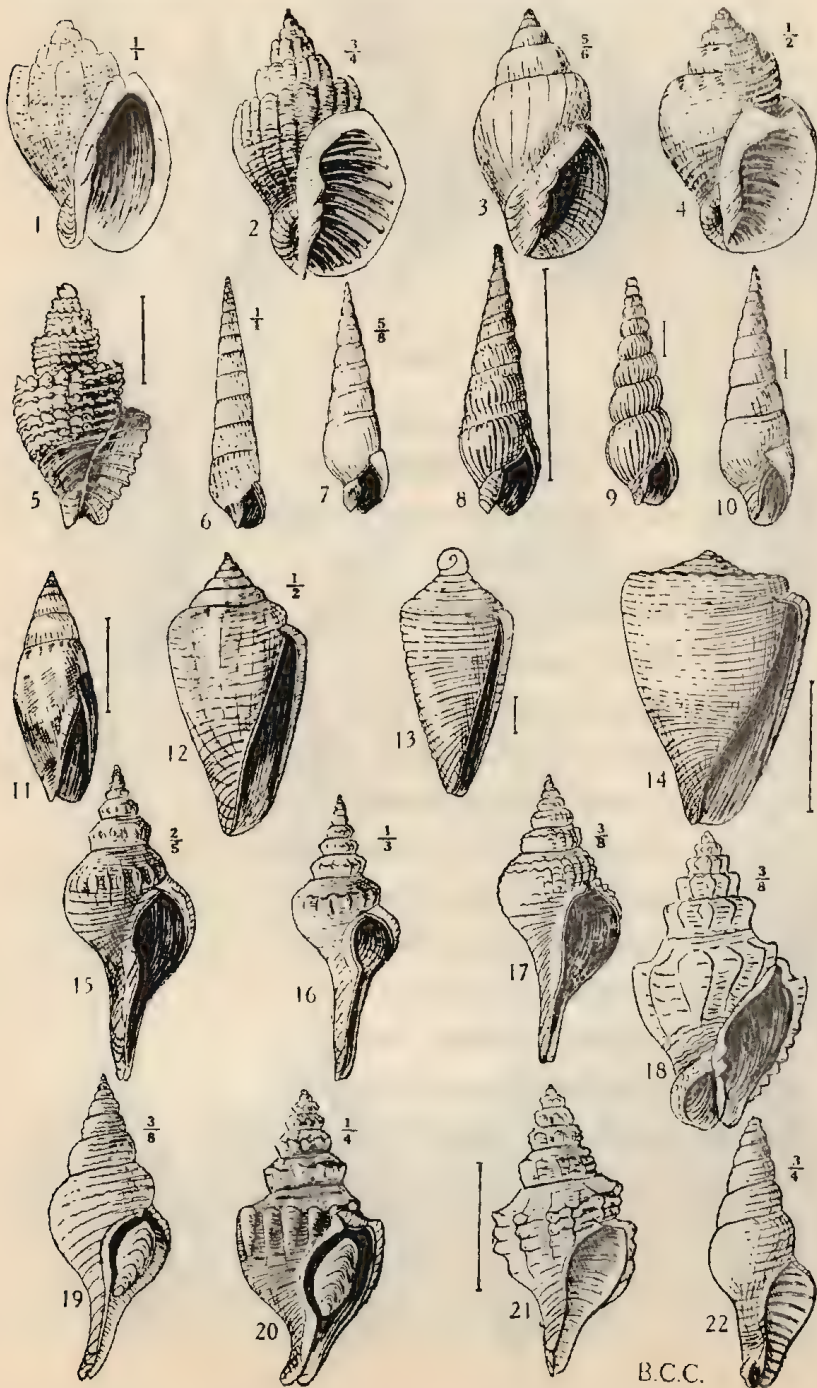
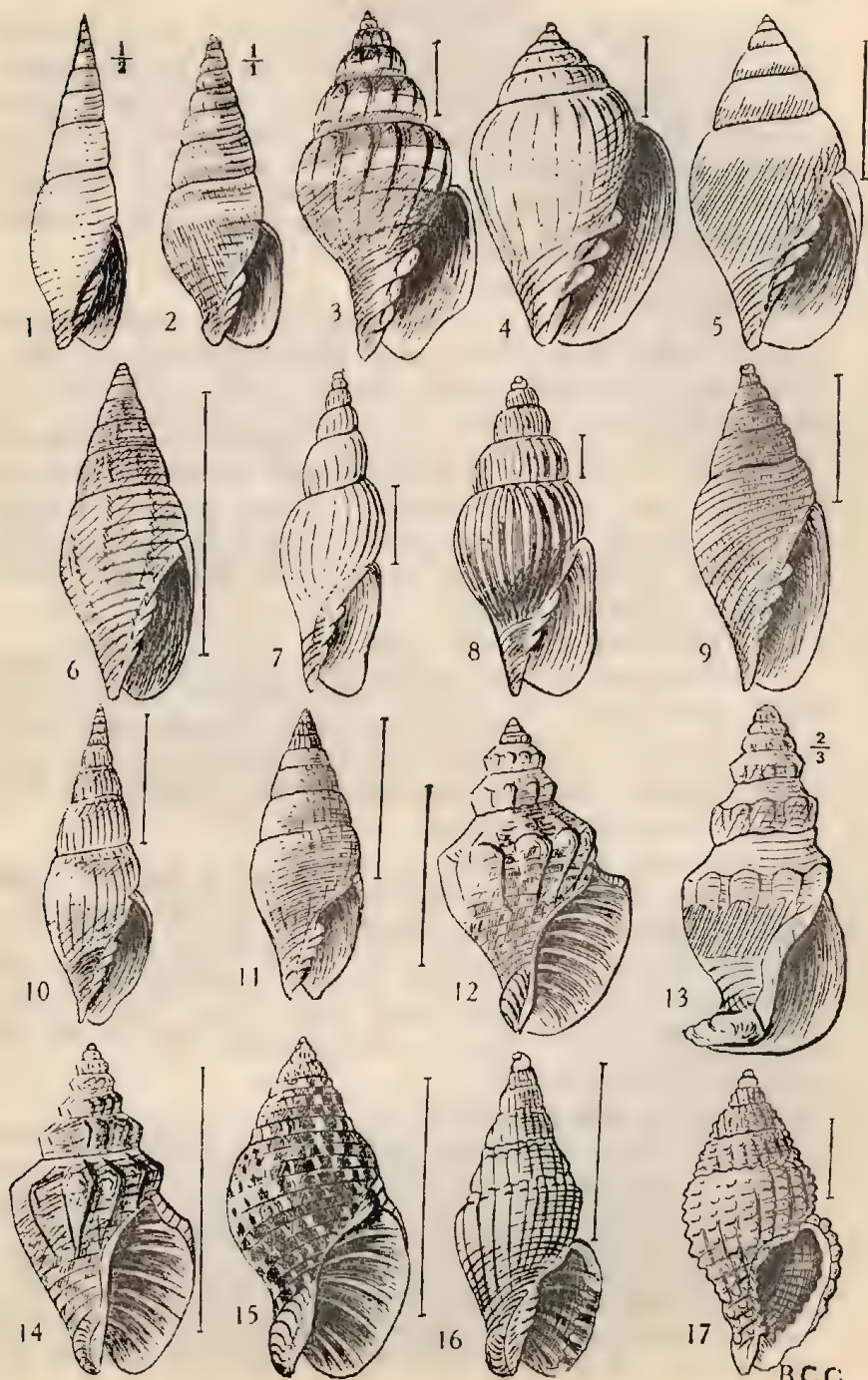


PLATE IV.

- Fig. 1. *Mitra glabra* Swainson.
- Fig. 2. *Mitra australis* Swainson.
- Fig. 3. *Austromitra schomburgki* Angas.
- Fig. 4. *Peculator porphyria* Verco.
- Fig. 5. *Proximitra pica* Reeve.
- Fig. 6. *Mitra rosettae* Angas.
- Fig. 7. *Mitroidea pellucida* Tate.
- Fig. 8. *Mitroidea jaffaensis* sp. nov.
- Fig. 9. *Cancilla strangei* Angas.
- Fig. 10. *Austromitra lincolnensis* Angas.
- Fig. 11. *Mitra vincentiana* Verco.
- Fig. 12. *Cominella acutinodosa* Reeve.
- Fig. 13. *Nassaria torri* Verco.
- Fig. 14. *Cominella eburnea* Reeve.
- Fig. 15. *Cominella lineolata* Lamarck.
- Fig. 16. *Josepha tasmanica* Tenison-Woods.
- Fig. 17. *Tasmeuthria adcocki* Verco.



TEREBRIDÆ.

"Auger-shells." Long, solid, pointed, narrow; many-whorled, whorls flattened, suture superficial; mouth small, notched below; columella without folds; operculum horny, annular, with apical nucleus. Distribution—Tropical and subtropical. Fossil—Eocene. Animal having the foot rounded in front, elongate behind; head rather large, with short, small, tentacles, furnished with eyes at their tips; between the tentacles extends anteriorly a rather long cylindrical trunk.

TEREBRA Lamarck 1799.

Tapering, narrow; spire very high, pointed, many-whorled; generally with a sutural band which does not correspond with a labial sinus; protoconch smooth, conoidal, with a deviated nucleus; mouth short, channelled above, and deeply notched at the base; outer lip thin; columella smooth, inflexed below, ending in a point, and an elevated border alongside the canal; inner lip thin, not callous, from underneath it arises a narrow rib which encircles the beak, limiting the growth lines of the basal emargination, and terminating at the angle of the outer lip. Type—*Buccinum subulatum* Linne.

T. ALBIDA Gray 1834. Pl. 3, fig. 7.

Medium size, turreted; white, with a row of small, round, brown spots beneath the suture; axial plications, distant, faint; growth lines oblique, gathered into groups, forming obsolete flat ribs, most valid below the suture; protoconch about $1\frac{1}{2}$ turns, slightly swollen, smooth; adult whorls flat. Height 46, diam. 12 mm. General, not common.

PERVICACIA Iredale 1924.

Elongate, tapering; protoconch whorls 2, smooth; adult whorls numerous, axial ribs sinuous, spirally interrupted by a smooth, concave, depression; suture impressed; mouth oval; outer lip thin, sinuate; columella straight, anteriorly a little bent but showing no folds; canal short, open. Type—*Terebra ustulata* Deshayes 1857. There is only the basal twist of the columella to represent a fold.

P. ASSECLA Iredale 1924.

Small, rather thin, glossy; pinkish-white, with fulvous spots below the suture and darker fulvous on the base; sometimes suffused with fulvous throughout; axial ribs sinuous, ribs interrupted by a smooth concave depression almost suture-like, about 18 ribs on the penultimate whorl; on the last whorl the ribs are prominent on the periphery, continuing, but fading, on the base which is rounded; adult whorls 10; last whorl about one-third the length of the shell. Height 14, diam. 4 mm. Gulf St. Vincent. Rare

P. KIENERI Deshayes 1859. (*Terebra*) (not *T. ustulata* Deshayes 1859). Pl. 3, fig. 8.

Small, rather thin, glossy; pale chestnut; axial ribs, not very prominent, obtuse, close, sinuous, about 24 on the penultimate whorl, ribs interrupted by a suture-like spiral concave depression; whorls flatly convex, last whorl short, obtuse below; base narrow, emarginate; columella twisted anteriorly. Height 24, diam. 7 mm. General, as far west as Streaky Bay—alive, down to 20 fathoms. Rather common on beach.

P. FICTILIS Hinds 1844. (*Terebra*).

Obesely acuminate, turreted; shining white, protoconch dusky, base blackish; smooth save for growth plicae which are short and sharp; whorls flattened; suture impressed; mouth effuse; columella slightly twisted; no canal. Height 13, diam. 4 mm. General, not common. Backstairs Passage, 20 fathoms, alive.

P. BICOLOR Angas 1867. (*Acus*).

Whitish, with chocolate-brown on the lower half of last whorl; axial ribs thin, ceasing on the last whorl at the periphery; whorls 9, nearly straight, more or less nodulous below the sutures; mouth small; columella arched. Height 14, diam. 4 mm. General, not common. May possibly be a synonym of *P. fictilis*.

ACUMINIA Dall 1908.

Adult whorls slender, smooth, not nodulous, summit narrowly shouldered; subsutural groove absent; columella with one fold. Type—*Terebra lanceota* Linne.

A. BRAZIERI Angas 1871. (*Terebra*). Pl. 3, fig. 6.

Elongate, turreted, pointed; pale straw colour, irregularly painted with brownish-orange, and flamed axially chiefly near the suture; an interrupted zone of suffused brown spots near the base of the last whorl above which is a pale band; protoconch of 4 whorls, smooth, convex, tinged with purplish-brown; axial riblets, faint, distant, rather nodose next the sutures, and microscopically, spirally, striate; mouth narrowly ovate; columella twisted; canal short, turned back somewhat. Height 30, diam. 6.3 mm. General, down to 22 fathoms. Not common.

EUTEREBRA gen. nov.

Small, regularly tapering; axial ribs, numerous, faint; spiral striae, microscopic; protoconch blunt, oblique, of $1\frac{1}{2}$ smooth whorls; adult whorls numerous, telescopically arranged, flatly convex, slightly shouldered; suture well defined. Type—*Terebra inconspicua* Pritchard & Gatliff 1902.

E. INCONSPICUA Pritchard & Gatliff 1902. (*Terebra*). Pl. 3, fig. 10.

Small, not solid; sordid white; irregularly, axially, streaked with brown; axial ribs, numerous, indistinct; spiral striae visible only under a lens; adult whorls 8. Height 11, diam. 3 mm. The slight obsolete sculptural characters readily distinguish it.

GRADATEREBRA gen. nov.

Tapering, narrow; axial ribs numerous, flexuous; protoconch blunt, two turns, smooth, round; last whorl cylindrically oblong, contracted at the base; columella slightly convex; anterior notch a little everted. Type—*P. scalariformis* sp. nov. Closely related to genus *Euterebra* but distinguished by the development of the axials and the convex whorls.

G. SCALARIFORMIS sp. nov. Pl. 3, fig. 9.

Small, solid, narrow; uniformly mahogany-brown; sculpture of regular, axial, slightly flexuous, rounded ribs, about 29 in the last whorl, much wider than the interstices; protoconch of two whorls, smooth, rounded, blunt at the tip; adult whorls 8, regularly convex; last whorl cylindrically oblong, convex, contracted at the base; suture distinct, impressed; mouth oblong-ovate; outer lip uniformly convex, simple, thin; columella slightly convex; anterior notch a little averted, moderately deep and wide. Type—Height 12, diam. 3.5 mm. Newland Head, 20 fathoms. Reg. no. D.10176 S. Aust. Mus. Some specimens are translucent with blackish-purple protoconch.

PARVITEREBRA Pilsbry 1904.

Small, narrowly fusiform; whorls numerous, last whorl longer than the spire and gradually tapering downwards; mouth lanceolate. Type—*P. paucivolvis* Pilsbry 1904 (Japan). Characterised by the absence of any groove defining a subsutural band, and by the long, gradually tapering, body-whorl without a differentiated siphonal fasciole at the base, the columella straight to its abrupt truncation below.

P. BRAZIERI Angas 1875. (*Eurypta*). Pl. 3, fig. 11. (= *Mangilia harrisoni* Tenison-Woods 1877: = *Terebra angasi* Tryon 1884: = *Olivella australis* Tenison-Woods 1878).

Small, moderately solid, narrowly fusiform; white, shining, with 3 broad spiral irregular bands of olive-brown, here and there passing into blotches; protoconch olive-brown; sculpture consists of axial plications, body-whorl more narrowly and finely plicate, spirally grooved at base; spire a little higher than the mouth; whorls 7, slightly convex; mouth narrow; columella slightly flexuous, covered with a thin callus; outer lip simple, acute. Height 13, diam. 4.5 mm. Not common, general, alive down to 20 fathoms.

P. TRILINEATA Adams & Angas 1863.

Small, turreted, fusiform, slender; white, brown banded at sutures; axially plicate, and faintly, distantly, spirally striate; spire a little higher than the mouth; whorls 9, flat, scarcely nodose at the middle of the whorls. Height 12, diam. 4 mm. Rare, general, alive to 17 fathoms.

CONIDAE.

"Cone-shells." Thick, inversely conic; whorls enrolled upon themselves; spire short, or not elevated, smooth or tuberculated; mouth long, narrow, the margins almost parallel, truncated at the base; outer lip notched at or near the suture; operculum, when present, rather small, with terminal nucleus. Distribution—Tropical and subtropical, usually in shallow water among rocks and coral reefs. Nearly 1,000 distinct kinds are known.

Fossil—Cretaceous. Animal having the head with a produced tubular veil; tentacles tapering, eyes on bulgings on the outer side of the tentacles; mantle enclosed, with an elongate siphon at the fore-part; foot simple, undivided, oblong, with a conspicuous water-conducting pore on the middle of the under surface. The "Cones" are a large family, characterised by the peculiar structure of the mouth of the animal, no less than by the similarity in the form of the shell. Haunting the holes and fissures of rocks and coral reefs, they lead a predatory life, boring into the shells of other molluscs for their food. They predominate in the Asiatic region and many species inhabit the tropical shores of America. Many beautiful Cones are taken in the waters of tropical Australia. South Australian Cones are much smaller. All possess a poison-gland, and several species are recorded as having inflicted poisonous bites, sometimes with serious results. At the Moluccas a naturalist was bitten by a "Cone," which suddenly exerted its proboscis as he took it out of the water, and he compared the sensation he experienced to that produced by the burning of phosphorus under the skin. The bite leaves a small, deep, triangular mark, which is succeeded by a watery vesicle. At least one Adelaide collector has been bitten, but not seriously, by our own *Floraconus anemone*. In addition to rocky situations, we recommend collectors to feel for live "Cones" below the growths of kind so often found attached to the living shells of Pinnae (Razor-fish). The danger of a bite in the case of our small Cones, we consider remote, and a live shell is worth several dead ones.

FLORACONUS Iredale 1930.

Light, rather thin; cylindrically conic; closely spirally striate, grooved at base; spire elevated, conic; whorls angulated, not coronate; protoconch mammillate, paucispiral, smooth, shining; body-whorl scarcely regular tapering; mouth long, not very narrow, margins nearly parallel; outer lip thin, sharp; columella slightly concave anteriorly. Type—*Conus anemone* Lamarck 1810.

F. ANEMONE Lamarck 1810. (*Conus*). Pl. 3, fig. 12.

Medium size, rather thin; pinkish-white, with a spiral row of reddish-brown irregularly shaped spots above the angle of the whorl and a second row medially in the body-whorl; also numerous reddish-brown blotches which tend to an axial arrangement; interior purplish; colour very variable; spiral striations, close, distinct, spirally grooved towards the base; periostracum olive-green, persistent; spire about one-sixth of the whole shell; adult whorls 9, rather sharply angulated; outer lip thin, brittle. Height 60, diam. 30 mm. Average specimen, 45 x 24 mm. Common, under rocks, and dredged alive down to 10 fathoms. Very variable, especially in the length of the spire, which, in extreme cases, may be as long as the body-whorl, or may be almost flat.

F. SEAGRAVEI Gatliff 1890. (*Conus*).

Size and shape similar to *F. anemone*, but this shell is polished and smooth on the body-whorl, coarsely spirally striate on the spire, closely striately grooved on the base, and the spire is somewhat concavely elevated. Colour, orange-brown, with irregular-sized white reticulations, encircled with many dotted lines of darker colour; a narrow white band at the shoulder, and a broader one below the middle of the body-whorl; spire maculated with orange-brown; interior roseate. Height 30, diam. 15 mm. Uncommon, general, down to 200 fathoms. Colour variable, may be cream with fawn blotches and light purplish at base. The smooth, shining appearance, and the colour, at once separate it from *F. anemone*, of which it appears to be the deep water representative.

PARVICONUS gen. nov.

Small, scarcely triangular, subinflated; growth striae distinct on spire; spiral striations obsolete; body-whorl smooth, shining with anterior valid distant striae; spire depressed, all adult whorls coronate; protoconch paucispiral, mammillate, smooth. Type—

Conus rutilus Menke 1843. Differs from *Floraconus* in having the spiral striations obsolete, and all adult whorls weakly coronate at the angle which is acute.

P. RUTILUS Menke 1843. (*Conus*). Pl. 3, fig. 14.

Small, thin, shining; chestnut, with 3 or 4 reddish-brown spotted lines; growth striae rugose, on spire only; spiral striations obsolete; faintly grooved at the base; adult whorls 5; outer lip thin. Height 16.5, diam. 11 mm. Not common, general, low water to 10 fathoms. Colour varies from cream, peppered with brown spots, through shades of brown to chocolate; spire also varies much in height.

RHIZOCONUS Morch 1852.

Conical, smooth, spire short, sharp; spirally finely striate; last whorl carinate at the suture. Type—*Conus generalis* Linne.

R. RATTUS Bruguiere 1792.

Yellowish brown or ash colour, sometimes with fine, chestnut revolving lines; large white blotches forming an interrupted central band and a narrow band at the shoulder. Height 33, diam. 18 mm. Very rare. St. Francis Island 7 specimens; Corney Point 1 specimen. Identified and pronounced typical by Charles Hedley late Conchologist to the Australian Museum and Sir Joseph Verco, Hon. Conchologist to the South Australian Museum. Iredale 1929 recorded this species from Queensland.

MAMICONUS gen. nov.

Small, solid, regularly conical, angled at the shoulder; spiral cords, numerous, defined by narrow, shallow grooves, becoming more crowded and oblique on base; growth striae, delicate; protoconch mammillate, smooth, two-whorled, slightly oblique; adult whorls 4; mouth linear. Type—*Conus superstes* Hedley 1911. From *Floraconus*, much smaller, protoconch more mammillate, spiral grooves stronger, spire whorls not tuberculate. With this can be associated the fossil *Conus convexus* Harris, from the Victorian Lower Tertiary.

M. SUPERSTES Hedley 1911. (*Conus*). Pl. 3, fig. 13.

Small, solid; white; some examples show faint brown dashes on the shoulder; spiral grooves, strong, over the whole shell, about 25 in the body-whorl below the shoulder. Height 8.5, diam 4 mm. Rare, general in South Australia, and 80 miles west of Eucla, 50 to 120 fathoms.

FASCIOLARIIDAE.

"Short Spindle-shells." Mostly large, solid, spindle-shaped, without varices; spire pointed; whorls numerous, round or angular; mouth oval, elongate; outer lip not thickened, usually striate within; columella with folds near the base; canal usually long, open; operculum horny, oval, with nucleus apical. Distribution—World-wide, tropical and subtropical, mostly in shallow water, amongst plants. Fossil—Upper Cretaceous. *Ainam* having the foot rather broad, short, head small, narrow, tentacles short, the eyes at their outer bases. The family contains the largest living Gastropod,—*Fasciolaria gigantea* from South Carolina which attains a length of about 2 feet. Of our shells the largest are the most common. All are carnivorous. Sexes distinct.

FASCIOLARIA Lamarck 1799.

"Short-spindle-shell." Rather large, solid, spindle-shaped; whorls round or angular; columella tortuous, with several oblique folds; outer lip internally crenate; canal open, moderate in length nearly straight; operculum large, horny, nucleus terminal, filling the aperture. Type—*F. tulipa* Linne. Fischer proposed the sectional name *Pleuroplaca* for the tropical *Fasciolaria trapezium* Linne, which is closely allied to *F. coronata* Lamarck.

F. AUSTRALASIA Perry 1811. (*Pyrula*). Pl. 3, fig. 15.

Rather large, solid; olive-green, under a persistent, shining, dark brown periostracum; spirally streaked within the crenated outer lip; spiral ribs rather crowded, rounded; growth lines fine; spire rather high, conical; protoconch of about two turns, large, convex, smooth, first whorl oblique; adult whorls 6, well rounded, with scarcely any shoulder; columella with 3 oblique, white, folds. Height 100, diam. 40 mm. All round the coast, common. Beach rolled shells are yellowish.

F. CORONATA Lamarck 1822.

Rather large, sometimes abbreviated, sometimes elongate; fawn or ashy-grey, under a persistent, shining dark brown periostracum; sometimes the shell is encircled with two more or less obscure, whitish, narrow bands; spiral ridges, narrow, close, a little rugose, with obtuse striae between; protoconch paucispiral, rather large, convex, smooth; adult whorls 7, convex, concavely slanting above, nodose at the angle, nodules rather swollen; columella with 3 folds, the lowest the largest. Height 145, diam. 65 mm. All round the coast, but less common than *F. australasia* and probably only a variant.

F. FUSIFORMIS Philippi 1847.

Medium size; pale brown, covered with a reddish-brown periostracum; spiral ridges throughout, close, with fine striae between, crossed by more numerous growth striae; spire pointed, nearly half the height of the shell; protoconch mammillate, paucispiral, smooth, oblique; adult whorls 8, convex, rudely plicately ribbed towards the apex; outer lip crenated, grooved within; columella with 3 folds, equal; canal narrow and slightly produced. Height 65, diam. 32 mm. Rare. South eastern coast of South Australia. Smooth varieties of *F. coronata* have been mistaken for *F. fusiformis*, which is a much smaller shell, narrow, more regularly and abundantly spirally grooved, and with well marked numerous spiral lirae in the throat.

COLIDAE.

"Long spindle-shells." From *Fasciolaridae*, the shells of this family have usually a longer spire; less inflated body-whorl canal longer narrower and straight instead of flexuous; columella without folds, not twisted; operculum more ovate, smaller. Distribution—Subtropical. Fossil—Cretaceous. Animal having a short, quadrilateral truncated foot with a transverse groove anteriorly; tentacles short, conical, joined posteriorly; siphon not extending beyond the canal of the shell. Colour of the animal bright red. The Colids mostly live at about low-water mark to moderate depths, amongst plants.

COLUS Humphrey 1797 (= *Fusinus* Rafinesque 1815).

Medium to large, spindle-shaped elongate; yellowish-brown or light horn colour, sometimes with reddish-brown stiff hairs or spots; never banded; spire long, acuminate, many-whorled; protoconch of about $1\frac{1}{2}$ volutions, rounded, globose, smooth, polished, generally quite small and marked off from adult whorls by a varix; mouth oval, usually striate within; outer lip simple; columella smooth; canal very long, straight, open; operculum horny, oval, acute, nucleus terminal. Type, by designation,—*Fusus colus* Linne (Ceylon).

C. AUSTRALIS Quoy 1833 (*Fusus*) (not *C. novae-hollandiae* Reeve 1848) (Pl. 3, fig. 16).

Brownish-red to yellowish; axially indistinctly flamed; interior white; spiral ridges throughout, close, sharp; whorls rounded or scarcely angulated, somewhat obsoletely plicately noduled; suture rude; canal very long, straight. Height 115, diam. 42 mm. Common. Encounter Bay and farther west. Alive down to 25 fathoms.

C. NOVAEHOLLANDIAE Reeve 1848 (*Fusus*).

Larger than *C. australis* and more elongate; yellowish-white, covered with a fibrous periostracum; neatly latticed with strong spiral ridges and axial ribs; ribs continued over the body-whorl, obliterating the carina and shoulder; whorls well rounded. Height 225, diam. 52 mm. Very rare in South Australia. Hardwicke Bay 1; Investigator Strait 1; all dead (Sir J. C. Verco). More common in Tasmania.

PROPEFUSUS Iredale 1924.

Elongate, spindle-shaped; spirally ribbed all over and with axial plicate ribs on the upper part; spire rather elevated, conical; whorls numerous, rounded, somewhat varicose; canal moderately long, slightly curved. Type—*Fusus pyrulatus* Reeve 1847.

P. UNDULATUS Perry 1811 (*Pyrula*) (= *Fusus ustulatus* Reeve 1847 = *F. legrandi* Tenison-Woods 1875, not *F. pyrulatus* Reeve 1847 from N.S.W.). Pl. 3, fig. 17.

Somewhat solid; yellowish, faintly stained here and there with reddish-brown; periostracum scaly, very thin; axial plicate ribs above, but obsolete on the lower part of the body-whorl; spiral ribs all over, rather close, rounded; outer lip thin, lirate within; canal moderately long, somewhat curved. Height 80, diam. 36 mm. Rather common on beaches, all along the South Australian Coast.

P. UNDULATUS PROFUNDIOR subsp. nov. Pl. 3, fig. 19.

Larger, thinner, wider, than *P. undulatus*; axial plications more subdued and obsolete on body whorl; upper part of whorls more rounded; canal less curved. Type—Height 96, diam. 40 mm. Encounter Bay 23 fathoms. (Reg. no. D.10178 S. Aust. Mus.).

MICROCOLUS gen nov.

Spindle-shaped, turreted, rather narrow; axial ribs thick, spiral lirae obscure; spire elevated, conical; protoconch few-whorled, blunt and smooth at first, then validly axially ribbed, afterwards acquiring spirals; no scar end to protoconch visible; adult whorls numerous, rather convex, angulated, concave above; canal very short, slightly curved. Type—*Fusus dunkeri* Jonas 1844.

M. DUNKERI Jonas 1844 (*Fusus*) (= *Fusus taylorianus* Reeve = *Siphonalia fuscozonata* Angas 1865). Pl. 3, fig. 19.

Small, solid; white, banded below, with an interrupted brown zone; axial ribs prominent, not many, crossed by spiral ribs, close set; protoconch, first smooth, then axially ribbed, followed by one spiral groove; adult whorls 7½, angulated, concave above, convex below; canal very short. Height 15, diam. 7.5 mm. Encounter Bay, both Gulfs and farther west. Beach and alive to 22 fathoms. Not common.

M. LINCOLNENSIS Crosse 1865 (*Fusus*)

Small, solid, subtranslucent; white, banded with blackish-brown above at sutures, and a broad band just below periphery on the last whorl; axial ribs, obtuse, cut at the middle of the whorls by two brown spiral lines, slightly wavy; protoconch very like *M. dunkeri* but broader, and having two spiral grooves instead of one; whorls 7, rather convex, body-whorl a little shorter than the spire; outer lip with the blackish-brown band showing through; canal short, slightly recurved. Height 13.5, diam. 5 mm. Encounter Bay, both Gulfs and to the westward. Beach and alive to 20 fathoms. Not common.

TURBINELLIDAE.

Solid, spindle-shaped, with a rather long canal; columella more or less thickened, with rather distant, almost horizontal, prominent folds; operculum horny, oval, with nucleus terminal. Distribution—Tropical and subtropical. Fossil—Miocene. Animal with a small head, tentacles convergent at the base, with the eyes on the outer sides; proboscis long; foot broad. The largest living Gastropod of Australasia—*Megalatractus aruanus*, from Northern Australia, belongs to this family. The Turbinellids mostly live at moderate depths.

ALTIVASUM Hedley 1914.

Ovately spindle-shaped, very solid, nodulous, umbilicated; spiral lirae, rather numerous, devious, crossed by close set, scarcely vertical, imbricating, crinkled, growth laminae which roughen the whole surface; spire elevated; adult whorls numerous, rather convex, roundly angled just below the middle, having several rounded, well-marked nodules, and ribbed in the lower half of the whorls; suture widely margined, wavy, crinkled; mouth obliquely egg-shaped, with a slight groove above; outer lip thin, slightly turned back, grooved within; columella with three distinct, equal, slightly oblique folds; inner lip thin, a little spread over the columella; canal about one-third of the whole aperture, open, wide, slightly deviated to the left, notched below, very slightly recurved; umbilicus wide; operculum egg-shaped, acute, nucleus at the lower apex. Type—*Latirus flindersi* Verco, 1914 (= *L. aurantiacus* Verco 1895 preocc.). Allied to *Vasum* Bolten, but differs in the greater number of whorls, smaller proportions of body-whorl, less prominent columella fold and wider umbilicus; spire appears comparatively longer in adult.

A. FLINDERSI Verco 1914 (*Latirus*) (= *L. aurantiacus* Verco 1895 preocc.). Pl. 3, fig. 18.

Small, very solid; rusty salmon, most marked near the margin of the mouth; internally of a deep salmon colour at the margin, fading into the polished bluish-white throat, with darker red lines in lirate impressions; spiral lirae 8 to 10 crossed by rather distant, rugged, growth lines; adult whorls 6, roundly angled, having 8 or 9 rounded, well marked nodules; last whorl with 9 very valid axial ribs, flatly rounded, highest at the shoulder, gradually narrowing below, to disappear at the middle of the base; outer lip crenated by the spiral lirae; inner lip, glistening pearly-white, with a rusty tinge, especially between the folds and near the upper part of the mouth. Height 91, diam. 52 mm. Backstairs Passage and westward to the Great Australian Bight, 18 to 120 fathoms. Rare.

LATIROFUSUS Cossman 1889.

Small, spindle-shaped, very narrow; spiral lirae all over; axial, rounded plications which may be obsolete; protoconch of $1\frac{1}{2}$ turns, mammillate, smooth; adult whorls numerous, convex; last whorl rounded; base rather abruptly contracted into a moderately long canal; columella with 2 or 3 strongly formed, sub-horizontal folds. Type—*Fusus lancea* Chemnitz.

L. SPICERI Tenison-Woods 1875 (*Fusus*) (= *L. nigrofusus* Tate 1891).

Small, spindle-shaped, very narrow; brown, under a black periostracum; spiral lirae, 8 or 9 on penultimate whorl, crossed by wavy longitudinal lines; axial plications obscure, rounded; body-whorl rounded; canal rather long, straight, nearly closed by a horizontal plate-like extension of the border; outer lip lirate within; columella with 2 folds. Height 22, diam. 6.5 mm. Encounter Bay, both Gulfs and farther west. Beach and alive to 13 fathoms. Not common.

L. PULLEINEI Verco 1905 (*Latirus*) Pl. 3, fig. 22.

Small, spindle-shaped, narrow, moderately thick; with curved axial rust-brown streaks on the ribs, sometimes broken into dots on the spiral lirae; rust-brown irregularly disposed on the body-whorl, also a rusty area on the varix of the notch; spiral lirae throughout, crossing over inconspicuous axial rounded riblets; spire elongated, whorls 8, regularly convex; suture distinct, slightly marginate; mouth elongately oval, with a tiny furrow above; outer lip finely crenated; columella somewhat concavely reflected below, forming a minute umbilical chink; canal nearly as long as the mouth, wide, open, scarcely notched. Height 48, diam. 18 mm. Beach, Largs Bay. Sub-fossil, dredgings, Port River. Rare.

VERCONELLIDAE.

Usually large, solid, spindle-shaped; periostracum frequently persistent; axial ribs more or less dilated; spiral lirae all over; spire shorter than the aperture; whorls angled; nodulous, rapidly excavated at the base; mouth large, pear-shaped; outer lip not thick; columella smooth; canal rather long, twisted; operculum horny, claw-shaped, nucleus terminal. Distribution—Australasia. Fossil—Miocene. Animal with a rather large foot, truncated in front; tentacles with eyes at their outer sides.

BERYLSMA Iredale 1924.

Large, spindle-shaped; spiral chords, strong, equally spaced; protoconch, few-whorled, globular, smooth; adult whorls angled or rounded at shoulder, then concave to suture, noduled or smooth; when noduled, tending to form heavy axial ridges; columella curved, without folds; canal long, open, sinuate; operculum horny, claw-shaped, nucleus terminal. Type—*Fusus waitei* Hedley 1904

B. GRANDIS Gray 1839 (*Fusus*) (= *Fusus tasmaniensis* Adams and Angas 1863; not *F. dilatatus* Quoy & Gaimard 1833; not *Siphonalia maxima* Tryon 1881).

Large, ventricose, strongly noduled; whitish, the spiral cords reddish-brown, mouth white; spiral chords all over, with finer intermediate threads; spire elongate; whorls 7 or 8; body-whorl coronated at shoulder with large blunt tubercles; outer lip crenulated within; columella smooth, white, polished, concave. Height 160, diam. 80 mm. General, on ocean beaches and to moderate depths. Not common.

B. OLIGOSTIRA Tate 1891 (*Siphonalia*).

From *B. grandis*, this shell has the spiral threads flat, without threadlets between them; spire proportionately broader; whorls only slightly angled, nodules obsolete. Height 90, diam. 38 mm. On rocks at extreme low-tide Guichen Bay, Encounter Bay. Not common. Iredale 1929 made a subspecies, *Largisipho*. We consider *B. oligostira* too closely related to *B. grandis* to warrant generic separation.

MITRIDAE.

"Mitre-shells." Solid, spindle-shaped; spire pointed, protoconch never mammilate; mouth small, elongate; columella with folds, of which the highest are the largest; mostly without a periostracum, which when present is thin, smooth; operculum absent or rudimentary. Distribution—Abundant in the coral seas, and usually at a moderate depth; subtropical species are mostly small, and some are found in colder latitudes.

Fossil—Cretaceous. Animal with a small narrow head; tentacles close together at the base, elongate, bearing the eyes at their sides; proboscis very long, cylindrical, flexible; siphon moderately long, simple at the base; foot small, triangular, usually truncate in front. Purple gland well developed, and when irritated, some species emit a purple fluid having a nauseous odour. The "Mitres" inhabit various stations; many are strictly reef shells, lurking in holes under seaweed, or under stones and dead coral; others burrow in sand at various depths; some prefer stony ground inside the reefs, where they remain concealed during the day, and like the sand species, are nocturnal in their habits. They are found at low-tide mark to moderate depths and are gregarious; sometimes dozens may be seen crawling over sandy mud-flats in shallow water especially as the tide makes. When the tide ebbs they bury themselves and are difficult to find. The Philippine Islands appear to be the metropolis of the *Mitridae*.

MITRA Martyn 1784.

Solid, elongate spindle-shaped; spire elevated, pointed; mouth narrow, notched at the base; outer lip not reflected, thickened and smooth within; columella somewhat obliquely plicate; no operculum. First named species—*Mitra tessellata* Martyn.

M. GLABRA Swainson 1821. Pl. 4, fig. 1.

"Glabrous Mitre." Medium size, solid, polished; light yellowish-brown, covered by a blackish-brown periostracum; axial striae, fine, crossed by slight spiral, incised lines; protoconch usually worn and smooth; adult whorls 9, flatly convex; suture impressed; base truncated, a little recurved, tinged orange-red, encircled by fine brown hair lines; columella with four folds. Height 90, diam. 25 mm. General, on sand flats, alive from beach down to 23 fathoms. Fairly common. This is the largest of the South Australian Mitre-shells.

M. RHODIA Reeve 1845.

"Rose-wood Mitre." Much resembles *M. glabra* but smaller; very dark brown; spirally very finely striated; columella with 3 folds. Height 28, diam. 9 mm. Rocky shores. Not common.

M. CARBONARIA Swainson 1822.

Small, solid, polished; dark chestnut; spiral striae, reticulated by straight growth lines; spire elevated, a little higher than the mouth; protoconch few-whorled, somewhat convex, smooth; adult whorls 6, flattish; suture superficial; columella with 5 equidistant, oblique folds. Height 32, diam. 11.5 mm. Gulf St. Vincent, west to Western Australia. Uncommon.

M. AUSTRALIS Swainson (= *M. melaleuca* Quoy & Gaimard 1833). Pl. 4, fig. 2.

"Common Mitre." Small, solid, rather narrow, smooth, polished; brown, encircled throughout with a single white, brown-stained belt; earlier whorls axially ribbed; spiral striae all over; growth lines distinct; spire higher than the mouth; columella brown, with four strong white folds. Height 37, diam. 14 mm. Common, generally distributed, under rocks at low-water. Very common on Snowden's Beach, Outer Harbour.

M. ROSETTAE Angas 1865. Pl. 4, fig. 6.

"Rosetta Head Mitre." Small, somewhat turreted, rather smooth; orange-brown; engraved with fine spiral lines of very small pits; rather high grooves at the base; spire about as high as the mouth; protoconch of $2\frac{1}{2}$ depressed, smooth whorls, making the shell appear decollated; adult whorls about 6, flat; suture scarcely impressed; outer lip very slightly lirate; columella with 4 folds, twisted below. Height 33, diam. 13 mm. Encounter Bay, Guichen Bay, Royston Head. Fairly common. The type locality is Rosetta Head (The Bluff).

M. PERKSI Verco 1908.

Rather solid, turreted; uniformly white, with very thin horny periostracum; darker along spiral lines and sutures; axial striae very fine; spiral incised lines of minute punctations, 8 in penultimate, and as many secondary; spiral grooves on base, about 12; adult whorls 7, scarcely convex; suture impressed but made distinct by a dark line of black periostracum; outer lip nearly straight, slightly effuse below; columella with 4 folds, sometimes 5. Height 24, diam. 7 mm. Beach, Encounter Bay (type) and to the westward. Not common.

M. VINCENTIANA Verco 1896. Pl. 4, fig. 11.

Small, moderately solid; uniform dull salmon; axial ribs on the first three or four adult whorls; spiral threadlets, rounded and indistinct; growth striae minute; a few distinct spiral furrows on base; protoconch small, oblique, of $1\frac{1}{2}$ smooth globose whorls; adult whorls 8, slightly convex; suture linear, minutely channelled; mouth opens widely into notch below; columella with 4 prominent folds; notch well marked. Height 20, diam. 7 mm. Investigator Strait, Spencer Gulf, Backstairs Passage 10-17 fathoms. Differs from *M. rosettae* Angas in the costation of the earlier whorls and in the absence of the punctated spiral incisions.

AUSTROMITRA Finlay 1926.

Small, spindle-shaped, slightly turreted; axially ribbed and distantly spirally grooved; spirally lirate on base; spire conic,

about the same height as the mouth; protoconch of $1\frac{1}{2}$ to 2 turns, small, mammillate, smooth; body-whorl with a flat, narrow shoulder; suture superficial; mouth long, narrow, angled above, with a widely open and somewhat recurved canal, notched at base; outer lip smooth within; columella slightly oblique, with 3 or 4 oblique folds, which are usually continued as spirals on the neck. Type—*Columbella rubiginosa* Hutton 1873 (New Zealand) From low water to moderate depths. Fossil—Pliocene.

A. TASMANICA Tenison-Woods 1874 (*Mitra*).

Attenuate at both ends; brown, with 2 or 3 yellowish-white, spiral bands; axial ribs thick, rounded, with small obsolete ribs which are most prominent on the upper whorls; spiral lirae fine, distinct; spire a little higher than the mouth; whorls 7, slightly convex; mouth rather narrowed; columella with 4 strong folds. Height 13, diam. 6 mm. Rare. South east of South Australia.

A. LEGRANDI Tenison-Woods 1875 (*Mitra*).

Very small, not unlike *A. tasmanica* except that its ribs are more permanent and larger in proportion to its size; translucent, shining, reddish-fulvous white, with a slender spiral fulvous line; columella with 3 folds. Height 5, diam. 2.5 mm. Rare. South east of South Australia.

A. SCALARIFORMIS Tenison-Woods 1875 (*Mitra*). Pl. 4, fig. 3.

"Ladder-like Mitre." Small; dull pale yellow, with an indistinct spiral white line; axial ribs thick, rounded, smooth, which disappear on the last whorl; columella with 3 stout folds. Height 10, diam. 4 mm. Uncommon. General as far west as Hardwicke Bay. Aspect scalariform.

A. SCHOMBURGKI Angas 1878 (*Mitra*). Pl. 4, fig. 3.

Small, rather solid; livid brown, with a broad pale suffused band on each whorl, and 4 narrow dark brown lines encircling the last whorl; axial ribs strong; whorls $6\frac{1}{2}$, convex; outer lip grooved within; columella with 3 stout folds which are carried round the base. Height 9, diam. 4 mm. Common. General. From *A. scalariformis* the white band is edged above and below by a capillary brown line, and two more are formed below the periphery; the shell is generally shorter and more ovate, and the whorls flatter.

A. ANALOGICA Reeve (*Mitra*) (= *M. vineta* A. Adams 1854; = *M. teresiae* Tenison-Woods 1875; = *M. scita* Tenison-Woods 1875; = *M. weldii* Tenison-Woods 1877).

Small, thin, subventricose, shining; brown, with two whitish bands; spire somewhat short, scarcely acute; whorls 5, smooth, inflated; suture finely canaliculate; mouth 3 banded within; columella with 3 folds. Height 13, diam. 6 mm. Rare. South east of South Australia. Some specimens are uniformly deep brown.

A. CINNAMOMEA A. Adams 1854 (*Volumitra*) (= *Mitra belapicta* Verco 1909).

Small, elongate, oval; pinkish-brown, with a spiral white band just below the middle of the whorls, bounded above and below by a line of opaque-white spots, and outside this by a fine broken brown hair line; a row of small brown spots below the suture; in the body-whorl is an articulated spiral of closely-set, axially curved white and brown spots; obscure white and brown maculations tint the base; axial ribs broad, rounded, vanishing towards the base; three spiral cords on the base; whorls convex; canal wide, short, slightly recurved, scarcely notched; columella with 4 folds, strong. Height 9.6, diam. 5.5 mm. Rare. South east of South Australia. Closely allied to *M. analogica* Reeve.

A. APICITINCTA Verco 1896 (*Turricula*).

Small, turreted, rather thin, shining; greyish-white, a broad indistinct pinkish-brown band beneath the suture, maculated at intervals with deep brown patches; on the body whorl three indistinct fine bands of brown dots; protoconch pinkish-brown; dead shell nearly pure white with a pinkish tip, and faint brownish maculations; axially finely ribbed throughout, about 35 ribs in the penultimate, slightly nodulated; spiral lirae numerous, flattened, crossing the ribs; in the early whorls a well marked spiral furrow below the suture cuts off a row of nodules from the ribs; several spiral furrows behind the notch; adult whorls 6, scarcely convex; columella with 4 folds. Height 11.2, diam. 3.5 mm. Gulf St. Vincent, Newland Head, 20 fathoms. Has a similar sculpture to *A. tasmanica* Tenison-Woods, but is more slender.

A. STADIALIS Hedley 1911 (*Mitra*).

Small, thin; white, opaque and glossy above, dull and sub-translucent below; a spiral pair of orange threads along the centre of each whorl; axial ribs, low, rounded, about 18 to a whorl, on the opaque portion, ceasing at the subtranslucent zone; spiral striae, few, on the upper part of the whorls; spiral lirae, numerous, along the tip of the snout; outer lip lirate within; columella with four folds, deep seated. Height 8.5, diam. 3 mm. Cape Wiles, 100 fathoms; Neptune Island 104 fathoms; Great Australian Bight, 40 miles west of Eucla 120 fathoms. Allied to *A. tasmanica* but narrower with slighter sculpture.

A. ARNOLDI Verco 1909 (*Mitra*).

"Arnold's Mitre." Small, solid, elongate-oval; articulated with large, irregular, blackish-brown blotches below the suture, about 9 in the body-whorl; and with two similar approximate spiral rows winding round the base from the back of the mouth, below which are dark maculations; a spiral of close-set axial, narrow, brown hair-lines covers the lower third of each spire whorl; axial ribs, wide, round, low, 13 in the penultimate, undulating the suture, vanishing towards the base; protoconch brown; adult whorls 5 slightly convex; suture distinct, narrowly tabulate; outer lip with numerous spiral plicae in the throat; columella with 4 stout, oblique folds; notch with a narrow reflected edge. Height 12, diam. 6.25 mm. Beach St. Francis Island and MacDonnell Bay. Rare.

A. RETROCURVATA Verco 1909 (*Mitra*).

Small, spindle-shaped; yellow-brown, with a white central broad band divided by a narrow colour band; base indistinctly axially flamed with white; axial ribs, from suture to suture, 21 in the body-whorl, with widely sloping sides, vanishing towards the base; spirals, narrow, microscopic; over the base are 16 distinct, oblique spirals; growth striae, fine, validly crossing the spirals on the back of the canal; adult whorls 6, convex; columella convexly curved, with 4 oblique folds; canal open, wide, curved dorsally. Height 16.5, diam. 10.75 mm. Rare. Beachport 110-150 fathoms. The special character is the arched canal.

A. LINCOLNENSIS Angas 1878 (*Mitra*). Pl. 4, fig 10.

"Port Lincoln Mitre." Whitish, tinged with irregular axial chestnut flames, with a narrow band of interrupted spots encircling the centre of the whorls, the lower half of the last whorl chestnut, with a faint band of reticulated brown and white spots in the middle; axial ribs stout, rounded, numerous, slightly nodulous below the suture; whorls 7, a little convex; columella with 4 strong folds; canal short, somewhat recurved. Height 16, diam. 5.3 mm. General, beach, to 20 fathoms.

A. TATEI Angas 1878 (*Mitra*).

"Tate's Mitre." Shining, ochraceous, with a broad, deep chocolate band next below the sutures, and a second similar band towards the base; axial ribs stout, distant, fading towards the base, which is encircled by three or four spiral ridges; columella with 4 folds. Height 7.5, diam. 4 mm. General, beach to 300 fathoms. Not common.

PROXIMITRA Finlay 1926.

Biconic, with rather low turreted spire; usually axially ribbed and spirally lirate; protoconch small, mammillate, of $1\frac{1}{2}$ convex whorls; adult whorls somewhat shouldered; mouth oblique, nar-

row, channelled above, produced below into a short open canal; columella with 4 folds medially. Type—*Vexillum rutidolomum* Suter 1917, a Miocene fossil (New Zealand).

P. PICA Reeve 1845 (*Mitra*). Pl. 4, fig. 5.

"Magpie-Mitre." Rather thin, slightly ventricose, spire rather short, sharp; blackish, snowy-white at the upper and lower parts, and a jagged white band next the sutures; whorls smooth; mouth rather large; columella with 3 folds. Height 17, diam. 8 mm. Spencer Gulf and to the south-east of South Australia. Common, beach.

PECULATOR Iredale 1924.

Ovate, spire short, mouth long and narrow; protoconch of two whorls, smooth, rounded; adult whorls sculptured with many axial ribs which become weak below; between the ribs are closely packed spiral incised lines; columella with 3 distinct folds and an obsolete one below; operculum small, pyriform. Type—*Peculator verconis* Iredale 1924. (N.S.W.)

P. PORPHYRIA Verco 1896 (*Imbricaria*). Pl. 4, fig. 4.

Small, solid; uniform mauve tint inside and out, protoconch dark mauve; axial plicae, low, indistinct, with finer, microscopic, axial striae; spiral striae, close set, most marked above the shoulder and just above the notch, faint elsewhere; spire about one fourth length of shell; adult whorls 5, scarcely convex, roundly angled at lower part; body whorl with rounded shoulder, then with a regular sloping curve; suture distinct, slightly margined, minutely crenulated; columella with 3 distinct, equal folds and an obsolete one below; operculum small. Height 10, diam. 5.75 mm. Backstairs Passage, Investigator Strait 15-20 fathoms; also beach, west coast of Yorke Peninsula, Port Willunga. Not common.

CANCILLA Swainson.

Spindle-shaped, slender; whorls having spiral elevated ridges, cancellated by plicate growth lines; outer lip thin, not dentate within; columella with 3 oblique folds. Type—*Mitra filosa* Lamarck (Philippine Islands).

C. STRANGEI Angas 1867 (*Mitra*) (= *M. franciscana* Tenison-Woods 1876). Pl. 4, fig. 9.

Narrowly ovate, subturreted, solid; white, with a broad pale chestnut band (2 on last whorl); scarcely shining; spiral lirae regular, decussate with obsolete axial ribs; protoconch of 2½ whorls, smooth, apex oblique; whorls 7, slightly convex; suture well impressed; columella obliquely 3 folded. Height 16, diam. 7 mm. South east of South Australia. Uncommon. Distinguished by its strong cancellate sculpture.

MITROIDEA Pease.

Spindle-shaped, very narrow, smooth, spire pointed; mouth narrow, linear; columella with numerous, small oblique folds, narrowed and turned to the left at the base; outer lip thickened, peculiarly truncated and recurved at the base. Type—*Mitra ancillides* Swainson.

M. PELLUCIDA Tate 1886 (*Mitra*). Pl. 4, fig. 7.

"Translucent Mitre." Small, slender, translucent, colourless, polished; two or three early whorls smooth, the rest with thick, depressed, axial ribs, the interstices linear and punctured; last whorl lirate at the base; protoconch obtuse; adult whorls 6, flatly convex; suture distinct; columella with 3 strong, oblique, folds, and slightly recurved anteriorly. Height 9, diam. 3 mm. Beach, Fowler Bay, Streaky Bay.

M. JAFFAENSIS sp. nov. Pl. 4, fig. 8.

Small, elongate-ovate, subdiaphanous; an obscure, broad, light-brown band may wind a little below the suture, and a narrow line just above; spire whorls convex, axially costate; 18 costae on the penultimate whorl; vanishing at the base of the body whorl; interspaces smooth; protoconch of two, smooth, convex whorls, apex oblique, acute; adult whorls 4; suture distinct, rising at the aperture which is narrow, oblique, elliptical; canal very short, columella plaits 3, oblique; 4 cords run from them over the snout; outer lip thin, simple, convex in profile, slightly compressed above the middle, spirally lirate in the throat. Type, Height 5, diam. 2.2 mm. Cape Jaffa, 90 fathoms. Reg. no. D.10182 S. Aust. Mus. Localities—Beachport, to 40 miles west of Eucla, 40-130 fathoms. Rare. The species appears distinct,

HARPIDAE.

"Harp-shells." Oval, ventricose, with numerous axial ribs at regular intervals; spire small; mouth large, notched below; columella without anterior folds or grooves. No operculum. Distribution—Tropical; Mauritius, Philippines, Ceylon, Australia, Polynesia, West Coast of America. Fossil—Eocene. Animal variegated with beautiful colours, having a very large foot, which is not entirely retractile within the shell and not reflexed on its sides; head and tentacles exposed; eyes conspicuous; mantle simple, without a tapering appendage in front. Mostly obtained from deep water and soft bottoms. Harps crawl with vivacity. In South Australian waters many Tertiary species existed, but only one Recent species is known. A few other rare Australian living forms are inhabitants of the warmer regions of the North and North-West parts of the continent. At places on our coasts *Hypocassis bicarinata* Jonas is erroneously styled a Harp-shell.

AUSTROHARPA Finlay 1931.

Oval, ventricose, spire rather short; numerous, distant, slightly elevated lamellae; base spirally wrinkled; protoconch large, hemispheric, with the tip laterally immersed; the second turn almost concealed by the first adult whorl; adult whorls few, sub-angulated; body-whorl inflated; mouth elongate-oval; outer lip ascending on the penultimate, its margin much thickened. Type—*Harpa pulligera* Tate 1889, a South Australian Tertiary fossil from Blue Clay at Schnapper Point.

A. PUNCTATA Verco (*Harpa*). Pl. 3, fig. 1.

Medium size, rather thin, smooth, glistening; uniform salmon tint, closely dotted with deep chestnut; two broad spiral bands (and several narrower and less distinct) of salmon in the body-whorl, with crescents of dark chestnut behind the remains of previous lips, and similar crescents here and there close to the suture; narrow, indistinct, whitish areas between all the bands; outer lip white on the inner edge; surface of body-whorl divided into ten longitudinal areas by the remains of slightly projecting lips, which behind the angle form erect, rounded, slightly-reflected plates, the earlier ones more and more worn away; the areas finely axially and spirally incisedly striate; protoconch of $1\frac{1}{2}$ turns, slightly mammilate, apex inserted, first whorl rather outstanding, next half-whorl marked off from the first by a depressed scar; spire whorls two, stepped, with slightly rounded angle; body-whorl ventricose, excavated close to the suture, forming a slightly rounded angle; then slopingly convex; mouth large, nearly plano-convex; outer lip slightly thickened outside, ascending posteriorly forming a notch at the suture; inner lip above forms a short sinus with the ascending outer lip; basal notch distinct, everted and recurved. Height 34, diam. 20 mm. Backstairs Passage, Newland Head 22 fathoms. Beach, Port Willunga. Rare. The distant ribs and dotted orament distinguish it at once.

BUCCINIDAE.

Oval, oblong or pear-shaped; canal short, almost obsolete, deeply notched at its base, with a corresponding fasciole upon the neck produced by growth striae of the notch; mouth large; columella excavated, generally twisted below, smooth, ridged, or toothed, but not plicate; operculum horny, nucleus terminal or lateral. Distribution—Cosmopolitan. Fossil—Cretaceous. Animal with large foot truncated in front; eyes at the base of the tentacles; siphon long. From between tide-marks to moderate depths.

COMINELLA H. & A. Adams 1853.

Medium size, solid, oval-conic; spire rather short, conic; protoconch obtuse, nucleus rounded, but little raised; adult whorls convex, grooved below the suture; sculpture of spiral striae cutting the surface into depressed ribs; last whorl large, ventricose; mouth wide, with a widely open canal below, deeply notched at its base; outer lip short, thickened, toothed within. Type—*C. virgata* H. & A. Adams.

C. EBURNEA Reeve 1846 (*Buccinum*) (= *C. costata* Quoy & Gaimard 1833 preocc.: = *C. angasi* Crosse 1864). Pl. 4, fig. 14.

Pyramidally ovate, solid; spire sharp, whorls concave round the upper part, nodose at the angle; yellowish-brown or ash colour, tessellated with a spiral series of reddish-brown oblong spots, sometimes confluent into lines; lip and columella fawn colour; periostracum greenish-yellow; sculptured with spiral incised lines. Height 34, diam. 17 mm. General, on sand flats and living down to 19 fathoms. Common. Very variable.

C. LINEOLATA Lamarck 1809 (*Buccinum*). Pl. 4, fig. 15.

Conical, spire pointed, whorls slightly convex, concavely impressed below the suture; alternately tessellated with yellowish-white and purplish-brown oblong spots; columella smooth; outer lip thin, crenulated; canal short. Height 30, diam. 15 mm. General, common. Very variable. *C. lactea* Reeve 1847, *C. tasmanica* Tenison-Woods 1875 appear to be variants of this species.

C. ACUTINODOSA Reeve (?= *C. adelaidensis* Crosse). Pl. 4, fig. 12.

Ovate, solid; spire short, turreted, whorls angulated round the upper part, sharply noduled at the angle, closely spirally grooved throughout; columella excavated, channelled at the upper part; ash or bluish-white, spirally articulated with blackish-brown; interior of mouth purple-black. Height 22, diam. 13 mm. Outer Harbour, not common. Distinguished by its gibbous shortened growth and purple-black mouth. Rather variable.

C. KINGICOLA Tate & May 1900 (*Cantharus*).

Ovately-fusiform, solid, opaque white; protoconch pale-orange coloured of $2\frac{1}{2}$ turns; adult whorls convex, subangulate, axially ribbed, about 12 ribs on the penultimate whorl, twice as wide as the interspaces; spirally sculptured with rounded compressed lirae; spirally adpressed below the suture; mouth elongate-oval; outer lip thin, convex; columella concavely arcuate, smooth; canal short, wide, upturned. Height 18, diam. 9 mm. South east of South Australia. Rare.

TASMEUTHRIA Iredale 1925.

Small, turreted, fusiform; whorls sloping, angulate above, concave at the suture; axially ribbed, ribs obtuse, rounded, ob-

solete below, narrower than the interspaces; spirally lirate; lirae obsolete above and on the ribs; mouth ovate, outer lip toothed within; canal short, sloping, scarcely curved. Type—*Siphonalia clarkei* Tenison-Woods 1876.

T. CLARKEI Tenison-Woods 1876 (*Siphonalia*).

Livid or brown; reddish-brown spots deeply shaded at the summit of the ribs form a kind of fascia on the upper whorls; outer lip often thickened into a kind of varix. Height 20, diam. 10 mm. General, common. Colour variable.

T. ADCOCKI Verco 1896 (*Tritonidea*) (not *Tritonidea subruginosa* Smith 1879). Pl. 4, fig. 17.

Ovate-fusiform; faint rusty-brown, a narrow white band above the suture and round the body-whorl just above the middle; above this a narrower darker band most marked on the ribs, giving an articulated appearance, and a similar less marked band below; axial ribs, wider than the interspaces, crossed by less valid, rounded, spiral ribs; protoconch conspicuous, of two smooth, convex whorls; adult whorls 4, convex; suture deep; mouth elongate-oval, narrowed below; outer lip convex, margin sharp, minutely crenulated within; columella concavely arcuate above, oblique below, minutely denticulated towards the base; canal short, wide. Height 18, diam. 9 mm. Gulf St. Vincent and Encounter Bay, beach, uncommon. The Western Australian shell *T. bednalli* is smaller and narrower.

T. FLINDERSI sp. nov.: nom. mut. (= *Tritonidea fusiformis* Verco preocc. by Martin 1883).

Closely resembles *T. adcocki* of which it is probably the deep water form. It differs in being less solid, axial ribs more slender and higher, mouth more contracted, the white band with its darker margins less conspicuous. Type—Height 17, diam. 8.5 mm. Locality—Investigator Straits 15 fathoms. (Reg. no. D10184 S. Aust. Mus.) General, dredged 15-110 fathoms. Rare. *JOSEPHA* Tenison-Woods 1879.

Ovately-fusiform, small, solid; periostracum present; axial ribs regular, scarcely coronate at the angle, crossed by fine spiral striae; base concave, spirally lirate; spire elevated, acute; protoconch of two smooth, inflated whorls; adult whorls convex, with a depressed groove below the suture, angulating the whorls and producing a contraction of the outer lip; mouth ovate, attenuate above, rather widely notched and recurved below; outer lip simple, thin, 7 narrow plicate teeth just within; columella canalliculate, with 1, 2, 3 or 4 indistinct folds set on a callosity (not always uniplicate as originally described). Type, *Josepha tasmanica* Tenison-Woods 1879.

J. TASMANICA Tenison-Woods 1879. Pl. 4, fig. 16.

Small, opaque; flesh-colour, rusty-brown or deep mahogany, with patches of bluish-white composed of oblong spots arranged between the spiral striae, most numerous just above and below the angulation and towards the base; in these areas the brown and whitish spots may be disposed as to form axial brown flames. Height 24, diam. 10 mm. General, on rocks in shallow water, South and Western Australia; fairly common. Becoming larger and more solid towards the west. Living shells are brightly glistening, but beach rolled specimens are usually uniformly dull rusty-brown.

NASSARIA Link 1807 (fide H. & A. Adams 1853).

Ovately-spindle-shaped; whorls axially ribbed and cancellate; spire pointed; mouth ending below in a long recurved canal; inner lip thin, circumscribed, transversely corrugately plicated; outer lip grooved internally; operculum ovate, nucleus terminal. Type—*Nassaria nivea* Gmelin (= *N. alba* Martini).

N. TORRI Verco (*Cominella*). Pl. 4, fig 13.

Spire whorls pinkish from the shoulder to the lower suture, fading towards the summits of the ribs; on the body-whorl this colouring ceases abruptly at the periphery with a spiral line of small deep-brown articulated spots, which similarly ornaments the spiral cords at the base; short, wavy, axial, reddish-brown lines and flames crowd along the margined suture; axial zig-zag dark-brown lines, rather more numerous than the ribs, cross a broad band on the body-whorl. Height 69, diam. 29 mm. On rocky coasts, St. Francis Island and extending to Western Australia.

THE MALACOLOGICAL SOCIETY OF SOUTH AUSTRALIA.

Branch of the Field Naturalists' Section of the Royal Society
of South Australia (inc.)

At the December meeting of the "South Australian Shell Collectors Club" it was decided to change the name of the club to "The Malacological Society of South Australia" and the following officers were elected.

Chairman		Mr. F. K. Godfrey.
Vice-Chairmen	Messrs. F. Trigg and B. C. Cotton.	
Secretary		Mr. W. H. Broadbent,
		c/o Epworth Book Depot,
		Pirie Street, Adelaide.

Sir Joseph C. Verco and Dr. W. G. Torr have generously offered to help finance the book on shells now being published quarterly in the "S.A. Naturalist," so that it is hoped to utilize more pages in future issues.

AFTER THE DROUGHT: LIFE ON THE GREAT STONY DESERT.

By GEO. AISTON (Marree, S.A.).

It was generally thought that the long drought had killed off all of the plants and animals of the Great Stony Desert, but the good rains that fell early in 1931 brought them all back. Everything seemed to be in a hurry to reproduce—the birds nested everywhere and anywhere; it was quite a common thing to get hit on the body by a bird that was leaving its nest in a hurry.

Nests were built where there was the slightest cover; a hollow in a post, a ledge where a branch had been cut off a post, an old billycan hung up on a fence—wherever the least privacy could be obtained. The fact that it was near a used path or gate did not matter, so long as there was some shelter from the elements and overhead shelter from the owls. The trees were full of nests, so full that it was almost impossible for the birds to get space for another nest.

The same thing happened with the small furred animals. Rats appeared in hundreds, building their nests in any old tins, in and among the bones of the cattle and horses that died in the drought; any little hole in the ground had its nest, in some cases two or three different species of furred animal would be found in the same hole. They came in such numbers as almost to become a pest, then they passed on and their places were taken by a different species. The first lot of rats consisted of *Pseudomys auritus* Thos. and the Fat-tailed Pouched Mouse, *Sminthopsis crassicaudata* Gould. These are gradually going and a small hopping mouse and a larger kangaroo-shaped rat are taking their places.

Even the rabbit came back. No one had seen a rabbit for hundreds of miles around during the five years preceding this "revival"; but they turned up from somewhere about six months ago, and are gradually travelling north.

The aborigines are having a great time among the animals. They have lived for so long without meat that, when they got a chance, they just gorged. Every little black child goes home with as many of the small animals as he can carry (after eating as many as he can carry inside) for the old people at the camp. And was not Zekie, aged about ten years, the proud boy when he caught his first rabbit! He had it hanging down his back when he came up to me, and between his pride in having caught a big fella Miroo (rat) and his fear that it might be a white fella animal that he must not kill, he was almost speechless. Since then, all of the blacks leave work to go rabbit hunting.

As I write (January 5), I have in view two trees, about 20 yards from my window. One tree is full of Galahs and Corellas. On the ground are perhaps twenty Little Crows, *Corvus Bennettii* North. Someone has just startled them, and, with a sound like an explosion, hundreds of Finches burst out of the two trees, their places being almost immediately taken by a flight of Shell Parrots (Budgerigahs). Back come the Finches, and one old Crow has walked into sight from somewhere. The Crows suffer terribly in the heat; every day a few fall, dead, out of the trees. The Magpies seem to suffer nearly as badly. The other day one flew in from the bush and collapsed about fifty yards from the trees. I picked it up, gave it a bath and put it in a waggon away from the dogs. It recovered about sunset, and flew away. Yesterday another Magpie flew into one of the workshops and stayed there all day, taking very little notice of anyone who went in for tools during the day.

Hullo! A turkey has driven the Crows out from under the trees; they are sneaking around just in the outer edge of the shade and cawing insultingly, the turkey apparently taking no notice. Directly it becomes dark the owls come hunting. Cheeky fellas, these. On two or three occasions they have just missed my head; they seem to drive right at the face, and only by quick dodging can one miss them. The little blackfellows kill them every time they find them in the daytime. I asked my friend, Zekie, the reason. He said they frightened him too much after dark, and he killed them in the day so that they couldn't frighten him at night.

I have never discovered the real reason why the blacks kill owls, but I have seen where they have killed dozens of them around a camp. The feathers were used for head decoration, so the birds were not coochy or uncanny. I think the reason must be in their night-flying—birds should not fly at night.

We still have some Pratincoles left, but a few months ago they were about the house in hundreds. I think they must migrate in the hot weather. I saw the first Hoary-headed Grebe of the year, and a Black Duck was on the house pond next morning. At the bore swamp, just over the hill, there are hundreds of ducks, Widgeon, Teal, Mountain Duck, and Black Duck; usually a few Swans, hundreds of Banded Stilts, and Avocets, and Dotter-ell by the thousand; the ground, at times, is mottled with them.

The stagnant pools of bore water breed water beetles by the bushel, and all of these birds are wading in the shallow pools, cleaning them up. It must be an ideal home for the birds—if not for the beetles!

—From "*The Victorian Naturalist*,"

February, 1932.

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The South Australian Naturalist

The Journal of the Field Naturalists' Section of the Royal
Society of South Australia and of the South Australian
Aquarium Society.

Adelaide



May, 1932

Vol. XIII.

No. 3

CONTENTS.

—:O:—

The late Arthur Mills Lea. (F. Erasmus Wilson)	89-92
South Australian Shells. (By Bernard C. Cotton and F. K. Godfrey). Part IV.	92-111
Botanical Notes on Central Australia (Part II.). (By J. B. Cleland, M.D.)	112-114
The Original Flora of the Adelaide Plains (Part III.). (By J. B. Cleland, M.D.)	115-118
Plants of the Encounter Bay District (By J. B. Cleland and J. B. Black.	118-120

The authors of papers are responsible for the facts recorded and opinions expressed.

Address of the Section: C/o Royal Society's Rooms, Institute Building, North Terrace, Adelaide.

Published Quarterly

Single Copy—NINEPENCE

Obtainable from Cole's Book Arcade, No. 14 Rundle Street, Adelaide.

Felstead & Omsby, Printers, Delmont's Building, Anster Avenue, Adelaide.

The South Australian Naturalist

VOL. XIII.

ADELAIDE, MAY, 1932.

No. 3.

ARTHUR MILLS LEA.

On February 29 died Arthur Mills Lea, of Adelaide, by far the greatest of Australian-born entomologists. He was born at Chelsea Street, Redfern, a suburb of Sydney, N.S.W., on August 10, 1868.

Those of us who knew him well, loved him; his nature was such that to know him and not to love him was unthinkable. He was intensely sympathetic and generous-hearted; he delighted in doing things for others, and would go to endless trouble to assist those even whom he did not greatly like. He loved little children particularly, and the writer, who enjoyed many a bush ramble with him, never knew him to pass a child without some kindly word of greeting.

It is doubtful whether there is any student of Australian coleoptera, either here or abroad, who has not benefited by his advice, or received some help from Arthur Lea. His enthusiasm for his hobby, for entomology was his hobby as well as his calling, was unbounded, and he seemed to instil enthusiasm into all who either met him or corresponded with him. Many long and weary hours must have been spent in determining material for others. Almost all Australian entomologists sent their coleoptera to him to be named, while he also received numerous parcels from overseas institutions and private collectors for the same purpose. The work he did in this direction alone was a man-sized job, yet he contrived to do an amount of taxonomic work that no man living or dead has ever equalled. Canon Blackburn, when he died, had achieved a world's record in having described some 3000 species of coleoptera. A.M. Lea's record reads as follows:—Passed 2000 mark, 13/12/1912; 3000, 27/12/1917; 4000, 16/10/1923; 5000, somewhere between 1928 and 1929; and when he left us, the number of species standing to his credit had reached the total of 5432. There are still some MS. descriptions awaiting publication. He had also written redescriptions of 221 species and produced 2160 drawings illustrating his articles.

One might think that no man could encompass more than this, yet Arthur Lea's writing on economic entomology were also considerable, some 130 papers being devoted to this branch of the science. He contributed also numerous articles to Tasmanian and Western Australian newspapers. His papers on taxonomic entomology, about 120, appeared in Australian publications devoted to science and in several English and European scientific journals.

When still quite a youth, he won first prize at a big Sydney exhibition for a collection of insects, and at the same time carried off first prize for the best set of drawings. Entomology appealed so much to him that he early forsook accountancy and, in 1891, joined the Department of Agriculture of New South Wales as assistant to the then Government Entomologist, Sidney Olliff. Owing to a period of financial depression, a few years later, the Government of the day retired many of its servants, Lea among them. Very soon he secured the appointment of Government Entomologist of Western Australia, a position which he held until 1899. In that year the Tasmanian Government obtained his services in a similar capacity, and in Tasmania he remained for twelve years.

During all these years he was officially an economic entomologist, and a perusal of his writings shows that very valuable services were rendered by him to the various departments with which he was associated. At heart, however, he was a taxonomic entomologist, and when the chance came, in 1911, to join the staff of the South Australian Museum as entomologist, he was quick to seize it, and that position he filled to the end. About this time he was also appointed consulting entomologist to the Department of Agriculture of South Australia, and later as lecturer in entomology at the University.

When Mr. Lea joined the Museum the entomological collection was a comparatively small one, and at his death it contained the finest collection of Australian beetles extant, besides a very rich collection of insects of all other orders. Towards the latter period of his office he also built up a very extensive collection of coleoptera from the Polynesian, Papuan, and Indo-Malasian regions. When at Adelaide he undertook the examination of no fewer than 1200 stomachs of birds, a labour of great economic importance, in which his wonderful knowledge of the external anatomy of insects stood him in good stead. His memory was remarkable; it was almost impossible to show him any named Australian species of beetle without his being able, almost instantly, to give its scientific name.

In 1924 the Fijian Government obtained a loan of his services for twelve months to endeavour to find a means of dealing with the Cocoanut Moth, *Levuana iridescens*, which was then threatening the extinction of the copra industry. . In connection with this work, he visited parts of Queensland, Torres Straits, Java, Borneo, and the Malay Peninsula in search of parasites that might be of service. He eventually discovered a Tachinid fly which attacked an allied Zigaenid Moth, *Brachartona catoxantha*, and immediately set about trying to arrange for direct transport by aeroplane in an endeavour to land his new discovery alive in Fiji. The Government, however, was unable to assist him in this direction, so he had to rely on shipping services. As there was no direct route to Fiji, the problem was one of difficulty. He succeeded in getting live specimens as far as Sydney, but soon after arrival they all perished. As the twelve month period had now expired, he had to return to the South Australian Museum, and leave to others the task of successfully introducing his discovery into Fiji.

The writer was recently shown a newspaper article in which the whole of the credit for the discovery of the parasite, which has since been successfully introduced into Fiji, is given to others, who came after him. I have before me, however, a letter signed by the then Superintendent of Agriculture in Fiji, which proves that the credit for the discovery belongs to A. M. Lea.

During the War period, when huge stacks of wheat accumulated at the seaboard, they became badly infested with grain weevils and other insect pests. A. M. Lea was one of the original appointees to the South Australian Weevil Commission, and travelled extensively in South Australia, Victoria, and New South Wales, reporting upon the conditions of the stacks. He was the first to suggest covering the stacks with malthoid, and using poisonous gases, and at the time it was estimated by competent authorities that £1,500,000 worth of wheat was saved by this means.

He personally collected a very great number of the insects which he described, having visited most parts of Australia and Tasmania, besides Lord Howe and Norfolk Islands, in search of them. He was a Fellow of the Entomological Society of London and the Linnean Society of New South Wales, and a member of the Royal Society of Victoria, the Entomological Society of Belgium, and the American Association of Economic Entomologists, also the Royal Society of South Australia and its Field Naturalists' Section.

Arthur Lea sleeps in the pretty little West Terrace Cemetery in Adelaide, a resting place not far removed from where his old colleague, Canon Blackburn, also sleeps. It is a coincidence that these two men, who were such giants in the entomological field, should have both passed the final years of their lives in the same city.

He has gone; but so long as there are votaries at the Shrine of Entomological Science, so long will the name of Lea be honoured.

F. ERASMUS WILSON,

With acknowledgement "*The Victorian Naturalist*."

SOUTH AUSTRALIAN SHELLS

(Including descriptions of New Genera and Species.)

PART IV.

By BERNARD C. COTTON and F. K. GODFREY.

In this part the following families are treated:—

Fusidae, Nassariidae, Pyrenidae.

FUSIDAE.

Elongate-oval, solid; variced, cancellated; spire conical, elevated, prominent; whorls but little convex, last whorl high, basal fasciole obsolete; mouth oval, narrowly channelled above; canal short, wide, notched at base; outer lip thickened, finely denticulate inside; operculum horny, claw-shaped, nucleus terminal. Distribution—Indian and Pacific Oceans, Australasia. Fossil—Tertiary. Animal having the foot squarish in front and the sides angular; tentacles with eyes near their bases; siphon long.

FUSUS Helbling 1779. Elongate-oval, solid; spiral lirae numerous, fine, crossed by fine, flexuous axial riblets; usually with varix on the penultimate whorl, and one on the body whorl opposite the outer lip, besides a prominent varix on the latter; spire high, conic, a little higher than the mouth; protoconch small, of one whorl, smooth, convex; adult whorls numerous; suture not deep; canal short, open, slightly recurved, moderately notched; outer lip rounded, with a thick, broadly rounded varix outside, thickened and dentated within; columella concave medially; operculum horny, with terminal nucleus. Type—*Murex (Fusus) intertextus* Helbling = *Triton reticulatus* Blainville = *Fusus mestayerae* Iredale 1915.

F. MESTAYERAE Iredale 1915. (= *Murex* [*Fusus*] *intertextus* Helbling = *Triton reticulatus* Blainville). Pl. 1, fig. 1. "Mestayer's Spindle-Shell." Small, solid, finely cancellate; light yellowish brown, sometimes marbled with reddish-brown; varices with a few brown bands; mouth light brown inside; outer lip white within; spiral lirae, numerous, fine, crossed by fine, flexuous, axial riblets; varix on outer lip, prominent, and usually one the dorsum of the body-whorl, and a third on the penultimate; adult whorls six, regularly increasing; outer lip with a thick rounded varix outside, and strongly toothed within; columella excavated, smooth, rounded; inner lip not broad; a rather broad tubercle next the inner lip, below the suture. Height 34, diam. 16 mm. South-east of South Australia. Not common. (Type locality—New Caledonia.)

F. SCHOUTANICA May 1910 (*Pisania*). Small, solid, cancellate; yellowish-brown; axial ribs, numerous, smooth, on the first adult whorl, becoming slightly spirally grooved on the second, and strongly cancellate by axial and spiral grooves on the remaining whorls; in each of the spiral grooves is a small keel; the square meshes so produced are each occupied by a small pustule, giving a granular appearance; protoconch of two turns, smooth, convex; adult whorls five, rounded, each with a strong varix; outer lip curved, sharp, backed by a heavy varix, strongly toothed within. Height 13, diam. 5.3 mm. Dredged off Cape Wiles (Hedley). We have not seen any South Australian specimens. (Type locality—10 miles east of Schouten Is., Tasmania, 80 fathoms). From *F. mestayerae*, this is much smaller and differently sculptured.

NASSARIIDAE.

Ovate, spire usually elongated; mouth notched at the base, without a canal; columella usually twisted by a basal fold, or simply truncate; inner lip usually callous; operculum horny, ovate, with terminal nucleus, margins plain or serrated. Distribution—World wide, principally tropical and subtropical, mostly in shallow waters, but some species have been dredged at 620 fathoms. Fossil—Eocene. Animal having a broad foot, somewhat squarely expanded in front with the corners often pointed; the foot bifurcates behind like a pair of tails; head broad, siphon long and thin, tentacles moderately long, bearing eyes on their outer sides. The Nassarids are very active, and not at all shy in an aquarium, where they may occasionally be seen floating with the foot upwards. Predaceous, feeding on other molluscs, the shells of which they bore; sometimes bored *Nassarius* shells are found indicating the possibility of cannibalism. In France

Nassarius reticulatus is very destructive to oysters, and it is recorded that an adult will bore through the shell of an oyster three years old, by means of its radula, within eight hours; an oyster a month old, is destroyed in half an hour. Some of our species are extremely common. *Nassarius pauperatus* and *N. victorianus* live between tide marks, hiding under the sand when the tide is out and showing up immediately on its return, when they may be readily observed. In pools left by the tide they will readily respond to a bait of cockle.

NASSARIUS Dumeril 1806. (New name for *Nassa* Lamarck 1799, not Bolten.) Ovate, ventricose, variously sculptured; spire moderately high; protoconch of two turns, turbinate, smooth, shining; adult whorls numerous; suture distinct, usually undulating; mouth ovate, deeply notched below, almost without a canal, but with a high fasciole; outer lip crenulated internally; columella smooth, twisted by an obliquely transverse fold; inner lip often widely spread over with enamel, a callosity or blunt dentiform fold below the suture; operculum horny, margin serrated or entire. The coloring of the whole genus is extremely variable and not of specific importance. Type—*Buccinum mutabile* Linne.

N. BURCHARDI Philippi 1849 (*Buccinum*). Pl. 1. fig. 2, "Burchard's *Nassa*." Small, ovate; yellowish-white, shining; body-whorl with two brown spiral bands, not always distinct; mouth shining, whitish; axial ribs about eighteen, narrower than their interspaces, and on the body-whorl are swollen out into knobs above; usually faintly spirally striate on the base; adult whorls five, very slightly convex; mouth as high as the spire; outer lip somewhat thickened, and may be smooth or have up to six teeth within; inner lip rather widely expanded, callus thick, slightly wrinkled. Height 13.5, diam. 9 mm. Beach, Gulf St. Vincent and Encounter Bay. Not common. (Type locality—Adelaide.) Specimens from Middleton (the open ocean form) are larger, more ventricose and more solid than the typical Port Adelaide and Port Wakefield shells.

N. DIPSACOIDES Hedley 1907 (*Arcularia*). Ovate, rather thin, remarkably tabulate; cream coloured except the protoconch which is pale-purple; axial riblets twenty-two on body whorl, oblique, with fine axial threads between them, and reticulated by spiral threads, eleven on body-whorl, producing sharp tuberculate granules by the intersection; axials and spirals cease on base and vanish on the subsutural shelf; a broad furrow encircles the base behind the canal; protoconch of four turns, conical, smooth, with a peripheral keel just exposed above succeeding

whorls; adult whorls four, slightly convex; body whorl with three rest stages, indicated by thin lamellae followed by grooves; outer lip without the usual thickening in the genus, sharp, denticulate by external sculpture; inner lip spread over with thick callus layer; canal very short, recurved, the truncate base of columella bent outwards. Height 12, diam. 8 mm. Cape Jaffa, 130-300 fathoms; 120 miles west of Eucla, 300 fathoms. (Type locality—35 miles east of Sydney, 800 fathoms.)

N. GRANDIOR Verco 1908 (*Arcularia*). Ovately-elongate, medium size, solid; bluish (or light-yellowish-brown); axial ribs, sixteen on the penultimate, extending from suture to suture, acute, as wide as the interspaces, crossed by sharp spirals, as wide as the spiral interspaces, producing tubercles, six principle in the penultimate; growth striae, crowded, irregular; spire considerably elevated; protoconch of two and a quarter turns, smooth; first whorl scarcely exsert, depressedly convex, second vertically flatly convex; adult whorls six and a half convex, shouldered; body whorl scarcely shouldered; suture distinct, wavy, narrowly margined; outer lip simple, thin; columella concave, obtusely angled below; inner lip a smooth glaze, complete; canal deviates well to the left and is recurved, notch well marked. Height 32.5, diam. 15 mm. Beachport to Cape Borda, 55-300 fathoms. Rare. (Type locality—Beachport, 110 fathoms.)

N. VERCONIS sp. nov. Pl. 1, fig. 7. "Verco's Nassa." The shell recorded from South Australia as *Nassarius mobilis* Hedley & May 1908 (*Arcularia*) is not that species. Verco 1908, doubted the diagnosis. Hedley, in a letter, wrote that the South Australian specimens could not be matched among the cotypes of *N. mobilis*. It is here described as a new species. Small, thin, conical; dull white, with faint brown blotches tending to form an indistinct band at the shoulder; axial ribs, prominent, regular, rather sharp, twenty-two on the body whorl, fading away at the base, crossed by wide spiral grooves with narrower raised ribs between them, fourteen on the body whorl; protoconch obtuse, of two whorls, smooth, polished, ventricose; adult whorls four, ventricose, subangulate; mouth ovate, oblique; outer lip round, thickened with an external varix, crenulated within; columella concave; inner lip narrowly spread, having an indistinct tubercle posteriorly; basal notch wide, open, recurved. Type—Height 7.2, diam. 4 mm. Beachport, 150 fathoms. (Reg. No. D10176, S. Aust. Mus.) Distribution—Beachport, Cape Jaffa, 40 miles west of Eucla, 100-300 fathoms. From *N. mobilis* Hedley & May (*Arcularia*) it is slightly more elongate, and the spiral grooves are much wider, leaving sharp spiral ribs.

N. PARTICEPS Hedley & May 1908 (*Arcularia*) (= *Buccinum glans* Linne 1767: = *N. intermedia* Angas 1877: = *N. suturalis* var. Angas 1867). Pl. 1, fig. 5. "The Comrade Nassa." Medium size, ovately-conical, rather thin, shining; yellowish, somewhat axially flamed with light brown, adult whorls encircled by fine, equally spaced, light brown lines, about ten in the body-whorl which also occasionally has a light brown band; protoconch dark violet, almost black (beach rolled specimens reddish-violet); growth lines plicate, base spirally striate, otherwise smooth; spire elevated; protoconch of one-and-a-half turns, smooth, ventricose; adult whorls three, convex, shouldered; suture scarcely canaliculate; outer lip rounded, slightly thickened, smooth within; inner lip narrow, with an indistinct tubercle above; basal notch wide, slightly recurved. Height 27, diam. 16 mm. Encounter Bay, Kangaroo Island, to 40 miles west of Eucla, beach to 120 fathoms. Not common. Distinguished by smooth whorls, light brown flames and thin light-brown spirals, also coloured protoconch. (Type locality—Port Jackson).

N. PAUPERUS Gould 1850 (*Nassa*) (= *N. tringa* Sowerby 1864: = *N. compacta* Angas 1865: = *N. rufocincta* Angas 1867). Pl. 1, fig. 3. "Meagre Nassa." Small, elevated, narrow; white or yellowish, sometimes banded with brown or marbled, or with the lower half of the body-whorl brown; axial ribs close, spiral lines many, fine; protoconch of one-and-a-half turns, smooth, white; adult whorls five-and-a-half, rounded; suture well marked, deep; mouth small, rounded, outer lip acute, thickened outside, dentate within; inner lip with a callosity of medium thickness, transversely wrinkled throughout. Height 8.7, diam. 4.9 mm. General, on beach and down to 200 fathoms. Not very common. (Type locality—Japan.) Differs from our other *Nassaræ* by its pupiform shape and comparatively small body-whorl and mouth. Rather variable in its colouring. *N. tringa* Sowerby is merely a stouter form.

N. PAUPERATUS Lamarck 1822 (*Buccinum*) = *N. lirella* Reeve 1853). Pl. 1, fig. 4. "Common Nassa." Acuminately-ovate, broad; white or yellow, usually banded with chestnut on the periphery and at the base of the body-whorl; columella and lip-margin white, sometimes tinged with chestnut; axial ribs numerous, dying out below the middle of the body-whorl, cut into tubercles by the spiral lines; a more prominent row of these tubercles immediately below the suture and separated from the rest by a groove; mouth rather large, well rounded; outer lip thickened, dentated within; inner lip well spread, callous, white;

basal notch deep, recurved. Height 16.4, diam. 10.6 mm. General, on sand flats, South Australia, Western Australia. (Type locality—South Australia.) Abundant in many places between tide-marks, and one of the first Gastropods to come out of the sand to meet the flowing tide.

N. NIGELLUS Reeve 1854 (*Nassa*) (= *Buccinum semi-granosum* Dunker 1846 preocc. by Wood 1828). "Swarthy *Nassa*." Acuminately ovate, broad; swarthy brown within and without, including the shining callus of the inner lip; axial ribs numerous, rendered granose by the spiral lines; outer lip simple, thin, scarcely margined without, smooth, not dentated, within. Height 13, diam. 8 mm. South-east of South Australia. Not common. (Type locality—New Zealand). Very variable and usually lighter coloured than the N.S.W. shell. Beach specimens may be brown, yellow, or almost white, although living shells are darker brown. Some whitish specimens have three narrow spiral chestnut bands. Distinguished from *N. pauperatus* by its colour, the thin outer lip in the adult, and the absence of white callus round the mouth.

N. MUNIERIANA Crosse & Fischer 1864 (*Nassa*). "Variced *Nassa*." Acuminately ovate, broad, rather thin, sub-translucent; white, with one obscure pale brown band; axial ribs numerous, scarcely granose; protoconch of one-and-a-half turns, smooth; adult whorls six, convex, with a rather thick varix on the penultimate and often on the preceding whorl; mouth ovate, white, with large callus ascending to the penultimate whorl. Height 16, diam. 9 mm. Rare. (Type locality—Gulf St. Vincent). Distinguished principally by its varices and distorted appearance.

N. TASMANICUS Tenison-Woods 1875 (*Nassa*). "Tasmanian *Nassa*." Acuminately ovate, broad; white, yellowish-chestnut, or brown; axial ribs numerous, scarcely distinct, with a row of tubercles below the suture, and hardly to be seen besides; mouth ovate, shining, white; outer lip solid, toothed within, a conspicuous tooth in the middle; inner lip very callous, broad. Height 13.5, diam. 8 mm. General. Not uncommon. (Type locality—Tasmania, North and East.) Closely resembles *pauperatus* and *victorianus*, except in size, colour, and the white callosities at the mouth. In *tasmanicus* the granose ribs are scarcely distinct.

N. VICTORIANUS Iredale 1915 (*Alectrion*) (= *Buccinum fasciatum* Lamarck 1822, preocc.). Pl. 1, fig. 6. "The Victorian Nassa." Acuminately ovate, rather solid, cancellated and granulated; variously coloured, white, yellowish, fawn or rusty brown, with a narrow or broad spiral band on the suture of the spire-whorls, continued over the periphery of the body-whorl; a second brown band on the base; sometimes there are other very narrow bands in addition; axial ribs, about twenty on the body-whorl, extending over the base to the fasciole, crossed by spiral ribs, producing well marked roundish granules at the points of intersection; spire higher than the aperture; protoconch of two turns obtuse, smooth; adult whorls eight, flattish, the body whorl convex; outer lip with a prominent marginal varix, having five teeth within; inner lip spreading, with a few small teeth; operculum oval, serrate on the columellar margin. Height 27, diam. 15 mm. General, strictly littoral. Very common. (Type locality—Shores of New Holland and Van Diemen's Land). Distinguished by prominent granules over the whole surface. The distinctness of the granules appears to vary with the ground colour of the shell. Also with the brown forms, whitish bands replace the darker bands the others. Some are unicoloured, very dark red or purplish red (Yorke Peninsula); others are glistening white, without any colouration, and some with the body whorl chocolate and having but one narrow light band; the columella may be brown, in which case there are a few brown blotches on the outer lip, within and without. Young shells, like other *Nassarii*, have the outer lip sharp, and the inner lip callus.

N. JACKSONIANA Quoy & Gaimard 1833 (*Buccinum*). "Port Jackson Nassa." Small, acuminately ovate, short; horn coloured with or without a narrow white or yellowish band on last whorl and white and reddish spots on the indistinct axial ribs which vary in validity in different examples; sculpture on most is limited to a subsutural row of tubercles and about ten spiral incised lines, the line below the tubercles being much the widest; spire short, pointed; adult whorls about five; mouth quadrately oval, whitish, effuse below; outer lip ascends, thickened above, not thickened internally, with a square brown spot at the margin and another behind the anterior notch, having about four teeth within; inner lip spreads somewhat above. Height 15, diam. 8 mm. Gulf St. Vincent, Investigator Strait, Backstairs Passage, 15-20 fathoms, Middleton Beach. Rare. (Type locality Port Jackson).

PYRENIDAE.

Small, suboval, broadly tapering or turreted, smooth or sculptured; protoconch few whorled, subglobular; mouth generally narrow, elongate, with a short canal; outer lip usually thickened or varicose, crenate inside; columella but little excavated, twisted; inner lip mostly plicate, operculum very small, lamellar, horny. Distribution—Mostly subtropical; Australasia. Polynesia, South Africa, east coast of North America, west coast of America North and South, West Indies, Mediterranean, India, China, Japan, Philippines. Fossil—Tertiary. About 400 recent species are known. Animal with a large flattened head; foot narrow, oval, elongate; siphon scarcely longer than the anterior canal. The *Pyrenes* mostly live in shallow water, on sandy flats or under stones, and on seaweed. Carnivorous. Sexes separate.

PYRENE Bolten 1798 (= *Columbella* Lamarck 1799). Pyrene—the Pyrenees Mountains were named after her. Ovate, spindle-shaped, or strombiform, spire elevated; smooth axially or spirally ribbed; mouth long, narrow, widely notched below; outer lip inflected, internally thickened and dentated; columella excavated medially; inner lip dentated below; operculum horny, lamellar, very small. (Type—*Columbella mercatoria* Linne).

P. ACUMINATA Menke 1843 (*Buccinum*) (= *Columbella menkeana* Reeve 1858: = *C. xavieriana* Tenison-Woods 1877). P. 1, fig. 10. "Acuminated Pyrene." Narrowly acuminate, smooth; light-brown, shining, with broad well defined subsutural band articulated very dark brown and white, the white areas may consist of white dots; in addition there may be a narrow white and brown spiral line on the periphery; the subsutural white areas or the brown or both may extend down to the peripheral line, or they may be continued obliquely to the base of the shell, and be united in a narrow brown area behind the notch. (*P. xavieriana* T. Woods). In these last the brown may be more or less flecked with white dots and so making the shell indistinguishable from *P. lincolniensis*; the shell may be uniformly light-brown or white, with a narrow brown-black line immediately above the suture and encircling the body-whorl, or pure white; striate on the base; adult whorls eight, rather flattened; outer lip slightly notched above. Height 16, diam. 7 mm. All round the S.A. coast and extending to Western Australia. Beach to 40 fathoms, a shallow water form. Common. (Type locality—Australia). Var. *Purpureocincta* Verco 1910, is a colour variety, the shell being very pale-brown, flecked all over with white dots, and having two broad delicate purple spiral bands, one just below

the centre of the spire whorls, the other below the periphery of the body whorl; or there may be a narrow articulated band below the suture, then a light-brown band, then the purple band, then a peripheral brown band, then the basal purple band. An exquisitely pretty shell.

P. LINCOLNENSIS Reeve 1859 (*Columbella*). "Port Lincoln Pyrene." In size and shape much like *P. acuminata*. Colour yellowish-white, covered by a network of chestnut, sometimes sparsely, and frequently so close as to cause the surface to appear of a uniform chestnut colour; may be variously stained with purple-chestnut; shell may be quite white with one fine hairlike black spiral line just above the suture and circling the body-whorl. Height 12, diam. 4 mm. All along the South Australian shore and dredged 7-55 fathoms. Common. (Type locality—Port Lincoln).

P. AXIAERATA Verco 1910. Spindle-shaped, glistening; tip pinkish, diminishing through four whorls to the bluish-gray ground colour of the rest of the shell; ornamented with bronze or amber-coloured axial bands, slightly narrower than their interspaces, about twelve to a whorl, from suture to suture, splitting into three or four threads forming a spiral band of hair lines below the periphery, and then continued as fewer and rather wider flames over the base; in some the bands below the periphery coalesce, two to form one basal flame; smooth, except for growth lines and spiral striae, also about fifteen oblique spiral lirae on base; whorls seven, feebly convex; body whorl much compressed at the base with a rather long contracted snout. Height 10.4, diam. 3.7 mm. Rare. (Type locality—Off Beachport, 40 fathoms, 6 specimens).

P. AUSTRINA Gaskoin 1851 (*Columbella*) (= *Columbella infumata* Crosse 1863). "The Southern Pyrene." Oblong-ovate, ivory-white, shining, smooth, last whorl encircled with a broad pinkish band; mouth rather squarely ovate; outer lip broadly notched at the upper part, conspicuously denticulated within. Height 12, diam. 5.5 mm. Gulf St. Vincent westward, also Rottnest Is., W. Australia. Beach to 17 fathoms. Fairly common. (Type locality—Australia).

P. JAFFAENSIS Verco 1910. Pl. 1, fig. 9. "The Cape Jaffa Pyrene." Cylindrically spindle-shaped; pure white; smooth but for very fine crowded scratches both axial and spiral; protoconch blunt, of one-whorl-and-a-half; scarcely convex, smooth, ending abruptly by a scar; adult whorls four, slightly convex;

suture distinct, somewhat canaliculate, very narrowly marginate, ascending near the mouth; body-whorl oval, somewhat compressed at the base; outer lip thin, simple, slightly excavate above; canal wide, sinisterally directed. Height 6, diam. 3.5 mm. Cape Borda to Beachport, 40-200 fathoms. An example dredged Gulf St. Vincent, depth unrecorded, is of a light-brown colour, protoconch darker. (Type locality—130 fathoms off Cape Jalla).

P. PULLA Gaskoin 1851 (*Columbella*) (= *tenuis* Gaskoin 1851: = *tenebrica* Reeve 1858: = *nubeculata* Reeve 1859: = *nux* Reeve 1859: = *badia* Tenison-Woods 1875: = *roblini* Tenison-Woods 1875: = *dictua* Tenison-Woods 1878: = *vincta* Tate 1893. "The Variable Pyrene." Oblong-ovate, smooth; dark brown and also within; columella and edge of outer lip white; whorls about eight, slightly convex, even at the suture; outer lip thin, smooth, dentate within; a few thin striae arise on the shining denticulated inner lip, and pass over the back of the canal which is rather wide and straight. Height 14, diam. 5 mm. Fairly general, beach to 12 fathoms. Fairly common. (Type locality unknown). Colour variations many. In addition to the uniform dark brown with white columella of the type, there may be an additional brown line just below the suture either with or without a white peripheral line; may be dark-brown, spotted obscurely with white, the white columella sparsely blotched with brown; another, like the last but with a white-and-black articulated line below the suture, and a peripheral spiral of white spots, also the protoconch may be purplish with the general colour purplish-brown; the dark-brown and spotted-white variety may have axial dark-brown flames, zigzag at the periphery; a shell, otherwise like the type, may have dark-brown flames or blotches extending from suture to suture; with a white or brownish ground colour there may be axial brown stripes, straight, wavy, or broken. *P. roblini* Tenison-Woods is pale chestnut, everywhere thickly spotted white and brown, and protoconch deep smoky brown, this shell also may be red-brown spotted. *P. dictua* Tenison-Woods is brown, closely reticulated with pale yellow sharply angular lines which form very fine acute zigzag markings of equal width and extremely close together. With this *dicta* form there may be a spiral band of white spots on the periphery; two bands of white and brown spots or one only which is just below the suture; whole shell may be purple tinted; there may be a broad amber-band on the body-whorl and a white band below it and still a faint one on the base. *P. vincta* Tate has a rather broad spiral red or brown band just above the suture and margined with white above, on a whitish ground; this varies again by the addition of a second band; the band may be scalloped above or below or

both; there may be axial hair lines from the band above to the suture, or in addition a double narrow spiral line at the periphery. Type localities for the many colour forms are: *tennis*, unknown; *tenebrica*, unknown; *nubeculata*, unknown; *nux*, Port Adelaide; *badia*, Swansea (Tasmania, east coast); *roblini*, Storm Bay (Tasmania); *dictua*, North Tasmania; *vincta*, Fowler Bay, Streaky Bay, Middleton, Cape Northumberland, also north coast Tasmania.

P. BIDENTATA Menke 1843 (*Columbella*). (Not the tropical Queensland *Pyrene versicolor* Sowerby, which is found subfossil at Murat Bay on the beach, associated in conglomerated masses with subfossil *Meleagrina fimbriata* Dunker, and *Anadara trapezia* Deshayes.) "The Two-toothed Pyrene." Ovately spindle-shaped, smooth, shining; white, with zigzag, brown, close, axial lines; spire moderately elevated; whorls obsoletely tuberculate on the swollen shoulder; base striate; outer lip dentate within; inner lip denticulate; columella blotched with lilac, having two folds anteriorly. Height 15, diam. 8 mm. Beach, South Australia and Western Australia. General, not very common. (Type locality—Swan River, W.A.).

P. SEMICONVEXA Lamarck 1822 (*Buccinum*) (= *Columella strigata* Reeve 1859). Pl. 1, fig. 8. "The Semi-convex Pyrene." Large for the genus, rather thick, smooth; there may be no markings, the shell being wholly white, or yellow, or rose-tinted, or whitish-purple, or dark-brown; there may be zigzag axial red-brown markings throughout, or throughout the spire and just below the suture on the last whorl, the rest unicoloured; a peripheral and an infrasutural narrow articulated white-and-brown band may encircle it, the rest uniformly brown, or minutely white spotted; it may be dark-brown, almost uniformly punctuated with white; or dark-brown with a rather wide white articulated band below the suture, and beyond this crowded spirally elongate narrow arrow-headed interrupted brown lines forming a spiral reticulate pattern, recalling *P. dictua* Tenison-Woods; mouth roseate within; outer lip strongly dentate. Height 22, diam. 11 mm. General, at low water and alive to 22 fathoms. Fairly common. (Type locality unknown).

P. ROSACEA Reeve 1859 (*Columbella*). "The Rosy Pyrene." Thick, smooth; colour flesh pink, with deeper shade towards the apex; whorls flattened, the last rather gibbous, contracted at the base; mouth small, outer lip somewhat swollen, denticulate within, slightly notched at the upper part. Height 16, diam. 6.5 mm. Beard's Peninsula. Uncommon. Probably only a variant of *P. Semiconvexa*. (Type locality unknown).

P. YORKENSIS Crosse 1865. "The Yorke Peninsula Pyrene." Rather solid, smooth, striate at the base; white and some pale red axial stripes, under a greenish-yellow periostracum; whorls nine, nearly flat; mouth oblong, slightly flexuous and white; outer lip slightly thickened and denticulate within; columella with some slight granulations. Height 19, diam. 8.2 mm. American River, Troubridge Island, Hardwicke Bay, Streaky Bay, Encounter Bay, beach, and alive to 22 fathoms Backstairs Passage. (Type locality—Yorke Peninsula).

P. TAYLORIANA Reeve 1859 (*Columbella*) (= *C. albomaculata* Angas 1867 [*Mitrella*]). Rather solid, smooth, shining; white, tinged with violet, lower portions of whorls faintly reticulated with chestnut; a row of dark-brown blotches on the spire whorls and a second row below the periphery on the body-whorl; whorls eight, flattened; base spirally ridged; mouth rather narrow; columella callous, transversely finely ridged in front; outer lip notched above, thickened without, dentated within. Height 10, diam. 4 mm. Variable in form and colouring. Very rare in South Australia. Port Wakefield 1; Gulf St. Vincent (7 fathoms) 1; Edithburgh 2 specimens alive. It is probable that the South Australian shells so named are really one of the many forms of *P. pulla*. (Type locality—North-west Australia).

P. VARIANS Sowerby 1832 (*Columbella*). The single specimen in Tate's collection was labelled Spencer Gulf in error, and has not been otherwise reported here. (Type locality—Galapagos Islands).

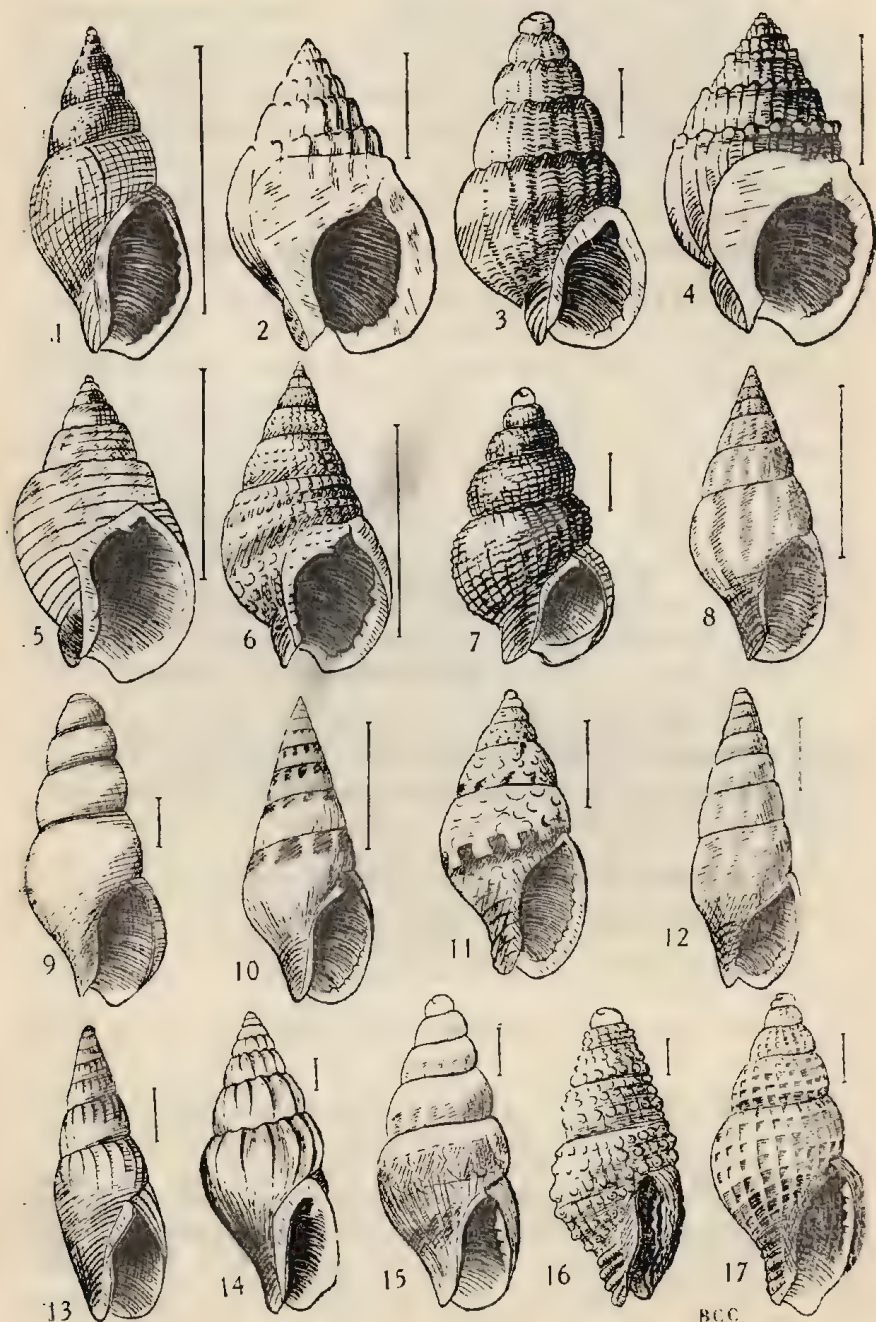
P. IRRORATA Reeve 1859 (*Columbella*).

P. MARMORATA Gray 1839 (*Columbella*).

P. VITTATA Reeve 1859 (*Columbella*).

We have not seen examples of these three species from South Australia.

PSEUDAMYCLA Pace 1902. Elongate-oval, solid, smooth; periostracum thin, adherent, transparent, greenish; protoconch of three whorls, smooth, without markings; base striate; mouth ovate, rather deeply notched below; outer lip curved, denticulate within; operculum, pale-horn, rounded, apical or subapical nucleus. (Type—*Buccinum dermestodeum* Lamarck 1822). Animal marbled with dark grey on upper surface; tentacles very short and stout with eyes near their bases on the external border; a pair of short caudal appendages (like *Nassarius*).



EXPLANATION OF PLATES.

- Fig. 1. *Fusus mestayerae* Iredale.
Fig. 2. *Nassarius burchardi* Philippi.
Fig. 3. *Nassarius pauperus* Gould.
Fig. 4. *Nassarius pauperatus* Lamarck.
Fig. 5. *Nassarius particeps* Hedley and May.
Fig. 6. *Nassarius victorianus* Iredale.
Fig. 7. *Nassarius verconis* sp. nov.
Fig. 8. *Pyrene semiconvexa* Lamarck.
Fig. 9. *Pyrene jaffaensis* Verco
Fig. 10. *Pyrene acuminata* Menke.
Fig. 11. *Pseudomycla dermestoidea* Lamarck.
Fig. 12. *Zella beddomei* Petterd.
Fig. 13. *Aesopus australis* Angas.
Fig. 14. *Zafra atkinsoni* Tenison-Woods.
Fig. 15. *Zafra fulgida* Reeve.
Fig. 16. *Macrozafra calva* Verco.
Fig. 17. *Antizafra plexa* Hedley.

P. DERMESTOIDEA Lamarck, 1822 (*Buccinum*) Pl. 1, fig. 11 (= *Columbella lineata* Brazier, 1877 = *C. maculosa* Pease preocc. not *C. tessellata* Gaskoin). Small, solid, elongate-oval, rather broad, smooth, shining; whitish, covered with small reddish rounded figures forming a scarcely apparent network, a small band of white and red spots above and another brown band below the sutures; a band of white and red spots round the middle of the body-whorl and a little brown band on the base; base striate; whorls about six, slightly convex; outer lip thin, faintly denticulate. Height 11, diam. 6 mm. Middleton to Port Lincoln, St. Francis Island. Not common. (Type locality—Mediterranean, according to Lamarck [Pace Proc. Malac. Soc. V, 1902, p. 253 concludes this is in error] then Sowerby and Reeve gave West Indies in error. Then Angas recognised the South Australian and New South Wales

P. MILTOSTOMA Tenison-Woods, 1876 (*Columbella*) (= *C. unisulcata* Kobelt 1897; not *C. saccharata* Reeve 1859). The "Red-mouthed Pyrene." Rather solid, ovate, tumid, smooth; translucent, unicoloured, mostly pinkish; it may be amber coloured, or yellowish, or white; a whitish shell may have an opaque white spiral band on the body-whorl, or a spiral of white dots; in addition there may be brown spots below the suture, or white spots, or white-and-brown; the space between these spirals may be dotted white; there may be a white-dotted peripheral spiral with a spiral of brown blotches above it, or the blotches may take the form of wavy axial brown thin flames; there may be a dark-brown hair line at the periphery with or without a white-dotted peripheral spiral; whorls six, slightly convex, last swollen; base spirally striated; suture margined; mouth edged with red; outer lip thickened, conspicuously toothed within. Height 6, diam. 3.5 mm. Streaky Bay, St. Francis Island, Fowler Bay, Investigator Straits. Beach, down to 110 fathoms. Rare. (Type locality—North coast Tasmania).

AESOPUS Gould 1860. "Aesopus, the Greek fabulist." Small, spindle-shaped, gibbous, broadly truncate below; suture very arcuate near the mouth; mouth lunate, with a posterior callus; columella smooth, vitreous. Type—*Aesopus japonicus* Gould (Japan). Animal white; emarginate in front, obtuse behind, bearing a horny flabelliform operculum; head small; tentacles short, broad, eyes in the middle, external; siphon, broad and very short. The curious curve of the suture near the upper angle of the mouth of the shell, as if it had been drawn backward, thereby pulling back this angle and curving the last whorl downward, is very peculiar. The form and aspect of the shell, and structure of the animal, indicate its biological position to be intermediate between *Mitra* and *Pyrene*.

A. AUSTRALIS Angas 1877 (*Truncaria*). "The Southern Aesopus." Moderately solid, shining; pale brown, rarely a bluish tint; axial plications, distant, low, on the upper portions of the whorls and crossed by fine, impressed lines; the middle of last whorl smooth, with a few impressed lines near the base; protoconch of two turns, smooth, papillose; adult whorls five and a half; sutures grooved; mouth narrow, dilated below; outer lip curved, slightly thickened within; columella somewhat flattened, covered with a smooth white callus, and abruptly truncate at the base. Height 7, diam. 2.3 mm. Off Beachport, 40 fathoms. Rare. (Type locality—Port Jackson).

ZAFRA A. Adams 1872. Ovately spindle-shaped, tumid in the middle; whorls axially ribbed, last whorl constricted at the base; mouth linear, notched below; outer lip sharp, somewhat sinuate above, slightly inflected in the middle. Type—*Zafra mitriformis* A. Adams 1872 (Japan). The shell characteristics are somewhat akin to those of *Mitra*.

Z. ATKINSONI Tenison-Woods 1875. (*Mangelia*) (= *C. speciosa* Angas 1877). Pl. 1, fig. 14. "Atkinson's Zafra." Small; some long and narrow, others short and plump; white, with axial, wavy, fine brown lines; there may be a spiral row of white spots immediately below the suture, but in some this may only be present in the upper whorls, while the later whorls have an opaque white spiral, with white prolongations from it on the axial ribs; a second spiral of white spots may occur just above the suture and above the periphery of the body-whorl; spots may be variously shaped; there may be a third spiral of white spots above the canal, which may also be white; sometimes the shell is brown, with all the margin of the mouth shining dark-brown; one variant has a golden-brown spiral band below the infrasutural row of white spots and no other brown markings; periostracum rusty; axial ribs twelve, rounded, vanishing at the periphery; protoconch of two smooth whorls; adult whorls six, slightly convex; suture canaliculate; outer lip thin, sinuous, medially compressed, with a rounded sinus just below the suture; canal open, reflected, notched. Height 4, diam. 1.5 mm. Beachport to Murat Bay. Beach, down to 62 fathoms. Gulf St. Vincent, alive in 5 fathoms. Not common. (Type locality—East coast Tasmania).

Z. BEACHPORTENSIS Verco, 1910 (*Pyrene*). "The Beachport Zafra." Small, solid; amber coloured, with a spiral of large opaque white spots below the suture; beneath this a narrow, continuous, white band; a second spiral of larger spots at the back of the mouth; axial growth lines, somewhat rude; eleven

spirals wind round the snout; protoconch blunt, of two smooth whorls ending abruptly; adult whorls about three, convex; body-whorl large, roundly contracted at the base; mouth with a distinct gutter above; outer lip swollen below the suture, then straight, then curved below; columella straight in upper half; and bent to the left in lower. Height 4, diam. 1.8 mm. Beachport, 40-150 fathoms. Rare. (Type locality—40 fathoms off Beachport). Differs from *Z. atkinsoni*, in its blunt apex; and from *Z. fulgida*, in its swollen whorls and its large peripheral row of white spots, and especially in the bend of the canal.

Z. COMINELLIFORMIS Tate 1892 (*Columbella*). "The Cominella-like Zafra." Rather solid, shining; uni-coloured, pellucid-white, rose, or purplish-brown; axial riblets strong, nine or ten on the penultimate, nodulous, dying out on the body-whorl; spiral striae, distant; protoconch blunt of two smooth whorls; adult whorls four, convex; body whorl slightly compressed medially, behind the mouth, with a slight tabulation at the suture producing a slight insinuation at the upper angle of the mouth which is narrowly subquadrate; outer lip edge blunt; canal short, everted. Height 9, diam. 4.5 mm. Uncommon. (Type locality—Fowler Bay to Victoria). Localities. Uncommon in S.A. alive 6-22 fathoms, Middleton, Yatala shoal, Backstairs Passage, also Albany, Esperance and Hopetown, W.A.

Z. DOLICHA Verco 1910 (*Pyrene*). Tapering, whitish, with a spiral row of axial opaque-white spots in the upper whorls, and a brown tinting of the margin of the mouth; smooth, except for seven spiral lirae on the base; protoconch, rather pointed of two smooth scarcely convex turns; adult whorls six, scarcely convex; body-whorl long, cylindrical; base roundly contracted; suture somewhat canaliculate; mouth angulate above, widely open below, notched; outer lip straight; inner lip thick, erect, thickened above. Height 4.8, diam. 1.4 mm. (Type locality—Gulf St. Vincent). The type is unique. It may be only a variant of *Z. atkinsoni*, but it is larger.

Z. FENESTRATA Verco 1910 (*Pyrene*) (not *Columbella vittata* Reeve 1859). "The Window Zafra." Very small, rather broad, solid, ovate; opaque-white, with a small pale-brown blotch in the lower half of the lower series of windows; broadly axially ribbed; short plicate tubercles from the suture to just beyond the shoulder, sixteen in the body-whorl; coarsely feebly spirally striate all over; a spiral row of translucent rounded areas, just above the sutures, like windows, as though formed by grinding away the opaque outer layer of the shell, eight in the body-whorl; a second series of windows just below the periphery; protoconch

blunt, of one convex whorl and a half, ending abruptly by a scar, adult whorls three-and-a-half; shouldered in the upper third; body-whorl somewhat angulate at the periphery; mouth contracted above; canal wide, deflected to the left; columella straight, feebly bidentate. Height 3.4, diam. 2.4 mm. (Type locality—Beach, Venus Bay, also St. Francis Island). Rare.

Z. FULGIDA Reeve 1859 (*Columbella*) (= *Columbella interrupta* Angas, not Gaskoin, 1865: = *Mitrella angasi* Brazier 1871: = *C. minuta* Tenison-Woods, not Gould, 1875: = *Mitrella tenisoni* Tryon 1883). Pl. 1, fig. 15. "The Shining Zafra." Small, long and narrow, or short and broad; smooth; usually transparent white, shining, with a white band round the body-whorl and partly in the spire, with white S-shaped marks, and a spotted white spiral on the base, with brown crescents below the suture; and brown axial hair lines to the base; there may be also two rows of brown crescents; there may be two articulated opaque white spirals; the base at the back is blackish-brown; the shell may be brown, or light brown, with dark purple tips and fine axial brown lines. A second series is distinct, the axial hair lines being absent; there may be axial brown narrow flames from the suture; there may also be two white spiral bands and another of white spots; these three spirals or two, or one, may be present without the flames; or the shell may be wholly white. A third series is cinnamon-brown, or bluish, or purplish-white; shells of this series are squat, with convex whorls slightly swollen below the suture, with a blackish-purple apex; there may be three spirals of dark-brown arrow-heads. A fourth series has two pale-pink spiral bands with a narrow spiral line of white spots immediately below the upper band; whorls fine, convex; outer lip thickened, dentate within. Height 6, diam. 2.5 mm. Beachport to King George Sound. Beach, to 150 fathoms. Common. (Type locality—Port Lincoln). Most variable both in shape and colouring.

Z. LEGRANDI Tenison-Woods 1875 (*Columbella*). "Le-grand's Zafra." Small, may be uniformly rose-pink, brown, or white; there may be a dotted white sutural line, and peripheral white spiral, continuous or interrupted; there may be white and amber-coloured axial flames from the suture to a white peripheral spiral band, or crowded opaque white axial narrow lines, or narrow obliquely spiral net-like (but not crossed) lines, either brown or opaque white, or in an opaque white shell there may be a spiral of distant fantastic amber blotches in the spire-whorls, an amber spiral above the suture, and a broad basal amber band; smooth; protoconch bunt of two smooth whorls; adult whorls four, convex; outer lip thin, simple. Height 9, diam. 3.6 mm.

Dredged, St. Francis Island, to Beachport, down to 200 fathoms. Uncommon. A fairly deep water form. (Type locality—King Island, 'Bass' Strait).

Z. REMOENSIS Gatliff & Gabriel 1910 (*Columbella*). "The San Remo Zafra." Minute, opaque white, with a translucent spiral band edged above with a broken brown hair line; becoming brown towards the lip; a second band winds round the base and over the snout, where it is mottled and streaked with brown; a brown spot at summit of protoconch; a peripheral band of rounded gemmules on adult whorls, and a second band of much finer beads just above the suture, with a third spiral fine row of beads near the base of the body-whorl; protoconch of two smooth whorls; adult whorls three and a half. Height 3.75, diam. 1.5 mm. Beachport to Western Australia, down to 150 fathoms. Uncommon. (Type locality—San Remo, Victoria).

MACROZAFRA Finlay 1926. Small, elongate-oval; fine spiral and stronger axial riblets, tuberculate at their intersection; spire elevated, conic; protoconch blunt, of two smooth, polished, convex whorls; base very little contracted; mouth somewhat narrow, vertical, produced below into a widely open and very short notched canal; outer lip vertical, dentated medially. Type—*Clathurella subabnormis* Suter 1898.

M. CALVA Verco 1910 (*Pyrene*). Pl. 1, fig. 16. "The Bald Macrozafra." Minute, usually translucent or opaque white probably from bleaching; when alive, translucent shining uniform light-amber, protoconch rather darker or purple; there may be a broad whitish spiral band; three spiral and about sixteen axial riblets in the penultimate, may be well marked, but the tuberculation may be obsolete, giving a latticed pattern; four spirals on the base are not tuberculate; protoconch smooth, ending abruptly; adult whorls four, convex; suture impressed; mouth narrowly oblong-oval; outer lip with three denticles; inner lip a thin glaze. Height 4.4, diam. 1.7 mm. Beachport to Rottnest Island, beach to 200 fathoms. Not common.

ANTIZAFRA Finlay 1926. Elongate-oval; close spiral ribs, numerous, crossed by axial plications, many, not very strong, vanishing on lower half of the body-whorl; protoconch papillate of two smooth, convex whorls; base contracted; suture well marked; mouth narrow, margins scarcely parallel, roundly angled above; anterior canal very short, open, truncated; outer lip sharp, slightly dentate within; inner lip thin, narrow, tapering to a point below. Type—*Columbella pisaniopsis* Hutton, 1884. Locality—Petane, N.Z. (Pliocene).

A. PLEXA Hedley 1901 (*Columbella*). Pl. 1, fig. 17. Rather solid, polished, cancellate; pale-brown, darker on base; axial ribs, about twenty, close, narrow, vanishing on base; the interstices of axials interwoven by finer, closer, and less prominent spiral cords, extending to the lower extremity, about five on each spire whorl; outer lip denticulated by three to five entering ridges. Height 6, diam. 2.4 mm. Spencer Gulf and south-east of South Australia, 90-150 fathoms. Uncommon. (Type locality—Ladies' Hill Beach, Sydney Harbour).

ZELLA Iredale 1924. Acuminately fusiform, smooth; spire attenuate, protoconch paucispiral, blunt; adult whorls numerous, very slightly convex; sutures impressed; mouth small, scarcely oval; outer lip simple, arcuate, contracted at the base, variced behind; columella nearly straight, callus slightly reflexed in front; canal very short, a little reflexed. Distinguished from *Pyrene* by the attenuate form, while the shape of the mouth is very different, the inner lip being crenulate and the outer lip sinuate; operculum irregularly oval, apex terminal, concentric striae fairly well marked. Type—*Terebra beddomei* Petterd 1884 = *Columbella attenuata* Angas 1871, preocc. not Beyrich.

Z. BEDDOMEI Petterd 1884 (*Terebra*) (= *Columbella attenuata* Angas 1871, preocc. not Beyrich. Pl. 1, fig. 12. Small, moderately solid; brown, with a pale band below the sutures, protoconch darker; adult whorls eight, very slightly convex, the last whorl grooved at the base. Height 9, diam. 3 mm. Dredged, 24-200 fathoms, not found in our shallow waters. (Type locality—Brown's River, Tasmania).

OUR EXCHANGES.

1. "The Victorian Naturalist." March number.
An article by Tarlton Rayment on "The Stingless Bees of Australia" is most informative and should be of great interest to our members.
2. "The Queensland Naturalist." October number.
3. "The W.A. Naturalists' Club Record." Numbers for January, February, March, and April.
4. Proceedings of the Linnean Society of New South Wales for April, 1932.
5. "The Australian Museum Magazine." June, 1932.
Articles on the Platypus and Spiny Anteater and on "Some Australian Wood-destroying Insects" and many others should appeal to our members.
6. "The Australian Museum Magazine." June Number. Some of the most interesting articles deal with the Egg-laying Furred Animals of Australia, the Ways of Wasps, and Snails.

BOTANICAL NOTES ON CENTRAL AUSTRALIA.

Fraser Creek and Mt. Ultim, 150 miles N.E. of Alice Springs.
Continued.

PART II*

By J. B. CLELAND, M.D.

Mt. Ultim and its Approach across the Plains.

Mt. Ultim, one of a series of peaks of a rugged, weathered sandstone range about 14 miles East of MacDonald Downs, is approached over extensive plains with occasional slight sandy rises and traversed about 9 miles out by a broad but shallow watercourse (Irukara Creek) heavily grassed on its banks. The plains vary somewhat, grassy intervals being replaced by open savannah composed of scattered Mulga (*Acacia aneura*), (*Atalaya hemiglauca*), Supple-jack, Ironwood (*Acacia estrophiolata*), a little Beefwood (*Grevilla striata*), and sometimes Native Orange (*Caparris Mitchellii*), Bloodwood (*Eucalyptus pyrophora* or *terminalis*) and here and there shrubs of the prickly *Acacia Victoriae* and of *Eremophila*. At about 8 miles this is varied by the appearance of Gidyea (*Acacia Cambagei*) whose twisted and spreading stems and glaucous foliage give a special character to such parts. As undershrubs, appear *Trichinium obovatum* and *Phyllanthus* and in places *Salsola kali*, and as grass a stiff *Aristida*. Mitchell Grass (*Astrebla*) appeared to grow in places that had been swampy after rain. In parts the plains had a covering of spreading bushes of *Acacia Kempeana* with its multistriate phyllodes.

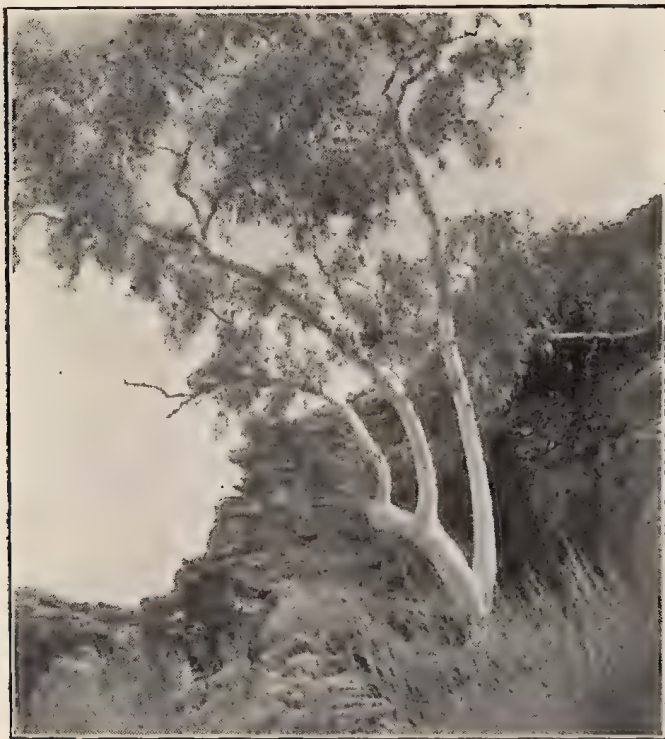
The broad shallow watercourse of Irukara Creek had several channels and the banks were covered with luxuriant but dry grass, growing through and above which the peuce-coloured pea, *Psoralea patens*, was quite a pretty sight. Some herb-like species of plants grew in the dry sandy bed, such as a spreading *Crotalaria*, a sedge, and two species of *Swainsona*. On the sides of the low banks, under shelter of the grass, grew many plants such as Nardoo (*Marsilea*, probably two species), a tall *Cyperus*, *Drosera indica*, *Erythraea australis*, *Lotus australis* var. *microphylla*, a *Swainsona*, a pink-flowered Scrophulariaceous (?) plant, an everlasting, several other composites and Love-grasses (*Eragrostis*, perhaps two species).

As we approached the foothills of Mt. Ultim, the country began to rise and became covered with loose stones. Amongst the Gidyea appeared bushes of the leafless milky *Sarcostemma australis*, a subshrubby *Trichinium* and an *Atriplex*. In the foothills by a dry watercourse were numerous shrubs, up to about

*Part I appeared in the S.A. Naturalist, Vol. XII, August, 1931, p. 64.



No. 1—Spring near Mt. Ultim, Central Australia. *Acacia holosericea* on the left, *Ficus platypoda* on the right.



No. 2—*Eucalyptus papuana*, Sandstone Range, junction of Bundey and Fraser Creeks, Central Australia.

8 feet high, of *Santalum lanceolatum*, the leaves rather broad and glaucous, the stems dark and irregular, the fruit dark plum-coloured. There were also Mulga, a few shrubs of Dead-Finish (*Acacia tetragonophylla*), Bloodwoods, Cabbage Gums (*Eucalyptus papuana*), etc. Porcupine Grass (*Triodia*) appeared as a dominant amongst the stones of the slope and extended over the ranges. After ascending the first rise, a small plateau and dry creek were met with before reaching the weathered undercut cliffs of the uppermost parts. On this plateau, besides *Triodia*, were found *Acacia varians* (with *Loranthus*), an *Acacia* with sticky phyllodes (*A. impressa* var.), a small *Acacia* with many sticky clustered phyllodes (*A. spondylophylla*), *Exocarpus*, *Santalum lanceolatum*, *Hakea lorea*, *Euphorbia australis*, *Gossypium Sturtii*, Bloodwoods, Cabbage Gums, *Trichodesma zeylanicum*, etc. We had lunch in a huge but narrow rock fissure near the top, in whose deepest shade was a nearly dry soak. Amongst the rocks on the cliff-side grew the very pretty *Helipterum Thomsonii* with broad sticky leaves and a strong smell becoming unpleasant (it is called 'Edelweiss' at Hermannsburg from its white flowers and from growing amongst the rocks), *Pomax umbellata*, a very prickly *Solanum*, the Native Fig (*Ficus platypoda*) and several small composites (*Minuria*-like).

Passing beyond the rock shelters in the cliffs, a moderate descent over loose stones and down exposed strata to the spring, revealed another species of Mulga (*Acacia adsurgens*) with slightly broader phyllodes, two or three other *Acacias* (one with sticky phyllodes) and a mallee with fruits like those of *E. microtheca*.

The spring itself was in a deep gorge-like cleft with massive boulders, the cleft descending rapidly and opening out into a narrow valley with tall sides. Chestnut-eared Finches were present in countless thousands. Fig trees grew in the cleft, a handsome *Acacia* (*A. holosericea*) with broad phyllodes possessing several nerves and with twisted pods formed a covering to the pool of water, the Bulrush (*Typha angustifolia*) and a Rush (*Juncus* sp.) grew in the water, and several composites in the banks, and *Tecoma doratoxylon*, the 2-prickled *Carissa Brownii*, a low, shrubby composite, a handsome *Olearia*, a *Myoporum*, Bloodwoods, *E. rostrata* and *E. papuana* were found amongst the rocks and on the valley sides. Near the water grew the purple-flowered *Stemodia viscosa* and the grass *Andropogon exaltatus*.

Low Quartzite Hill at Macdonald Downs.

Near Macdonald Downs station were low quartzite hills or rises. These in places are tilted somewhat and have a slight escarpment to the south with a gentle slope to the north. A special vegetation exists amongst the loose stones and firmer

rocks, being mostly, when we visited it, very much dried up, but a little more luxuriant on the lower slopes. Tufts and imperfect rings of Porcupine Grass (*Triodia* sp.) were scattered over the surface—all had long ceased flowering; some had a sticky resinous substance clinging to the bases of the branches. *Acacia spondylophylla*, resembling a *Lycopodium* in the arrangement and appearance of its phyllodes, grows in such places as a low shrub with the heads of flowers on long slender peduncles. Several species of *Trichinium* (or *Ptilotus*) were found—*T. obovatum*, an almost leafless twiggy species and a robust species. Several yellow-flowered Malvaceae, a *Cassia*, scattered Mulga (*Acacia aneura*), a dry Caryophyllaceous plant, a bluish-flowered shrubby *Eremophila* and a dry tufted grass also occurred. Lower, where apparently there was more moisture, grew a few plants of *Petalostylis labicheoides* with large showy orange-yellow flowers, a thick-stemmed *Cassia*, a smaller but similar species, a *Scaevola*, etc. A few other grasses, all dry, were noted. An *Eragrostis* grew in the soil where the plain commenced. The Rubiaceous shrub *Coelospermum reticulatum* with holly-like leaves grew near the base of another stony rise and on the plains grew Gidyea (*Acacia Cambagei*).

Sandstone Range at the junction of the Fraser and Bunday Creeks.

On August 31, a delightful morning was spent visiting a sandstone range about 10 miles north of Macdonald Downs homestead, situated near the junction of the Fraser and Bunday creeks. Flats covered with a wealth of shrubs occupied the space between the grotesquely weathered sandstone masses and slopes. Here were found the Coral-tree or Bean-tree (*Erythrina vespertilio*), mostly still leafless after the cold of winter; some Coolibahs (*Eucalyptus microtheca*), the glaucous mallee with broad opposite leaves (*E. gamophylla*) and the large-fruited mallee (*E. pachyphylla*) with remarkably picturesque buds and young capsules, the holly-like Rubiaceous shrub *Coelospermum reticulatum*, and another with berries, *Cassia pleurocarpa*, and two robust *Cassias*, probably *C. venusta* and *C. notabilis*, an *Acacia* (*A. umbellata*) with multistriate phyllodes and narrow pods, a sticky *Acacia* with broad phyllodes (*A. impressa*), and *A. patens* with prickly phyllodes.

Amongst the rocks grew *Ficus platypoda*, a *Grevillea*, *Prostanthera striatiflora* and *Isotoma petraea*. A sedge (*Cyperus* sp. near *C. sedra*) grew in the shade of some of the rock masses. Amongst other plants noted were *Fimbristylis*, *Cleome viscosa*, *Gossypium australe*, a prostrate Malvaceous plant, a Solanaceous plant in berry, *Scaevola ovalifolia*, and a purple-flowered composite. A Loranth grew on one of the *Acacias*.

THE ORIGINAL FLORA OF THE ADELAIDE PLAINS. PART III.

By J. B. CLELAND, M.D.

Further references to the original appearances of the Adelaide plains will be found in an article by Dr. A. A. Lendon in the Proceedings of the Royal Geographical Society of Australasia, S.A. Branch. XXVII., 1925-6. On page 23 Dr. Lendon says that in 1840 Dr. B. A. Kent erected "East Park Cottage" in a clump of wattle-trees, the site being later occupied by the Kent Town Brewery. These wattles were evidently *Acacia pycnantha*. On page 41, he mentions that Thomas Rhodes, writing in 1850, says that the country between Adelaide and Kensington was picturesque to a degree: gentle undulations of well-grassed park-like country, watered for a considerable portion of the year by mountain streams (the Green Hill rivulet, now called First Creek; the Hallett rivulet, or Second Creek) and heavily timbered with red and blue gums; abundance of birds and of kangaroos to be met with, and even camps of aborigines.

REMNANTS OF THE FLORA IN WEST TERRACE CEMETERY.

Owing to portions of the ground in West Terrace Cemetery having remained as yet undisturbed and owing to the long interval that has elapsed since some of the burials took place, a number of native plants, presumably all belonging to species that were original denizens of the locality, may still be found there. The following have been noted (an asterisk indicates that the species has not been recorded in the previous lists by Mr. J. M. Black, Mr. E. H. Ising or myself):—*Stipa* (two, if not three, species, one with broad leaf blades and pubescent nodes), *Danthonia* sp., **Dianella revoluta* (common—also in Walkerville Cemetery), **Eucarya acuminata* (*Fusanus acuminatus*, Native Peach or Quandong growing round several old graves, possibly the nuts had been dropped here, though doubtless Native Peaches grew once naturally on the plains), **Loranthus Exocarpi* on *Acacia Farnesiana* (planted), *Enchylaena tomentosa*, *Bassia enchylaenoides* (*Enchylaena villosa*—a few small plants), *Acacia obliqua*, *A. ligulata*, *Eucalyptus odorata* (Peppermint Gum—a few small dying trees), *Convolvulus erubescens* (common) and *Goodenia pinnatifida* (several colonies).

BEAUMONT COMMON.

**Stipa bigeniculata* Hughes and **S. variabilis* Hughes have both been identified at Kew from this locality. Another species also occurs. The Wallaby grasses **Danthonia semiannularis* (Labill.) R.Br., **D. setacea* R.Br. and **D. auriculata* J. M. Black

are also found here. *Loranthus Exocarpi* grows on olives and **Rhagodia nutans*, *Bassia euchyalaenoides* (June), **Acacia armata* **Halorrhagis* sp., *Convolvulus erubescens* and *Helichrysum* probably **H. semipapposum*. *Lomandra glauca* already recorded should be *L. filiformis*. *Acacia obliqua*, *Eucalyptus odorata* and *E. leucoxylon* have been previously noted.

UNIVERSITY GROUNDS.

Typha angustifolia (Bulrush—in slightly swampy ground and near the lower end of Kintore Avenue), *Stipa* sp. (near the Nutrition Laboratory), *Atriplex Muelleri* (near the Refectory), **Heliotropium europaeum* (near the Refectory, December to March) and **Gnaphalium luteo-album* (a few plants have appeared near the bases of the row of posts to the west of the W.E.A. Room—possibly seed has escaped from the adjacent Department of Botany). *Cotula australis* grows in the Adelaide Hospital grounds.

MISS ALLEN'S GARDEN IN THOMAS STREET, UNLEY.

Portion of Miss Allen's grounds, which have been in the possession of the family since 1851, has been kept as far as possible in its original native state. A visit here with her nephew Mr. Allen Simpson, in November 1930 showed that the following native plants had survived:—Kangaroo Grass, a Spear Grass (*Stipa* sp.), Wallaby Grass (*Danthonia* sp.), *Dianella revoluta*, *Dichopogon strictus*, *Lomandra* sp., *Calostemma purpureum*, **Chenopodium carinatum*, *Acacia obliqua*, *A. pycnantha*, *Oxalis corniculata*, *Eucalyptus odorata*, *Convolvulus erubescens* and *Pittadinia triloba*.

Mr. Simpson informs me that in 1879 She-oaks were growing in the garden but they may have been planted; there were also two small Grass-trees (*Xanthorrhoea*) which Miss Allen said had been there as long as she could remember. Native Mignonette (*Stackhousia*) and a Sun Dew (*Drosera*) grew in the paddock by the drive. Apparently in 1851 the property was Pepper-mint (*Eucalyptus odorata*) scrub.

OTHER LOCALITIES.

Mr. J. M. Black has recorded a number of species for Enfield. To these may be added *Euchyalaena tomentosa* and **Leptomeria aphylla* (near the Main North Road). *Chenopodium carinatum* has appeared in my garden at Beaumont, and in a grassy field on Highfield Estate between Beaumont and Portrush Road occur *Trichinium spathulatum*, *Acacia armata*, *Convolvulus erubescens*, **Dichondra repens*, *Pittadinia triloba* (already recorded as *P. australis*) and **P. tenuissima*. **Scirpus maritimus* grows with *Typha angustifolia* and *Cyperus vaginatus* in swampy ground near St. Saviour's Church at Glen Osmond terminus.

Mr. Allen Simpson doubts if the Bulrush grew about Adelaide in the early days. Mr. Rankine of the Railway Department, an old colonist, told him thirty years ago that there were only reeds along the Torrens in his boyhood. Mr. Simpson thinks that the Bulrushes followed the formation of the lake made by the weir. He doubts whether *Acacia armata*, the Kangaroo Bush, was indigenous to the Adelaide district. He believes that it was an introduction from Kangaroo Island—hence the name—and that seed was sold at 10/- per lb. in the forties. Fifty years ago, Unley and many other suburbs were full of hedges of this *Acacia*.

MR. A. A. SIMPSON'S GROUNDS AT BURNSIDE.

Though not strictly within the limits of the Adelaide plains, being definitely on the foothills, it may be of interest to record here the plants noted in October, 1930, and February, 1932, on this property, Undelcarra, situated just east of Lockwood Road, Burnside. These were as follows:—Kangaroo Grass, *Neurachne alopecuroides*, *Amphipogon strictus*, *Stipa* sp., *Calamagrostis filiformis*, *Danthonia* sp., *Schoenus Tepperi*, *Dianella revoluta*, *Burchardia umbellata*, *Lomandra dura*, *L. juncea*, *L. sp.*, *Thysanotus Patersonii*, *Tricornye elatior*, *Xanthorrhoea semiplana*, *Calostemma purpureum*, *Microtis porrifolia*, *Casuarina stricta*, *Hakea rugosa*, *Grevillea lavandulacea*, *Exocarpus cupressiformis*, *Loranthus Exocarpi* (both red and green flowered forms) on *L. Miquelii*, on *Casuarina stricta*, on *Acacia armata* and on *Crataegus* (Hawthorn), *L. Miquelii* on *Casuarina stricta*, on *Eucalyptus odorata* and on *Crataegus*, *Trichinium erubescens*, *Drosera Whittakeri*, *Bursaria spinosa*, *Cheiranthra linearis*, *Acacia armata*, *A. obliqua*, *Eutaxia microphylla*, *Kennedyia prostrata*, *Linum marginale*, *Hibbertia sericea*, *Pimelea* sp., *Calythrix tetragona*, *Eucalyptus odorata*, *E. leucoxydon*, *E. rostrata*, *Epilobium junceum*, *Halorrhagis teucrioides*, *H. heterophylla*, *Cynoglossum suaveolens*, *Scaevola microcarpa*, *Goodenia primulacea*, *G. amplexans*, *Felleya paradoxa*, *Olearia ramulosa*, *Vittadinia triloba*, *V. tenuissima*, *Leptorhynchus squamatus*, *Helipterum australe* and *Calocephalus citreus*.

Mr. Simpson has also noted the Carrot Fern (*Cheilanthes tenuifolia*) and five species of Orchids (only one species is listed above). Second Creek runs through Undelcarra and the Peppermints (*E. odorata*) grow on the south side of this, *E. rostrata* and *E. leucoxydon* on the north.

Thus about 57 species of native plants are to be found on Undelcarra.

SUMMARY.

In the previous communications by Mr. J. M. Black, Mr. Ising and myself, 56 species of native plants were recorded for the Adelaide plains. Excluding consideration of the plants in Mr. Allen Simpson's grounds at Burnside, the present lists bring the number up to 76.

PLANTS OF THE ENCOUNTER BAY DISTRICT. Third List of Additional Records.

By J. B. CLELAND and J. M. BLACK.

—O—

We published our Second List of Additional Records in the "South Australian Naturalist" for May, 1929 (Vol. X., No. 3, page 37). At that time we stated that we expected that 20 or more species still awaited discovery. This number has already been exceeded and we can now add 36 (perhaps only 35—*Santalum lanceolatum* may have been wrongly labelled) and one variety to our previous lists. The total number of species known for the district is now approximately 769 (excluding 16 varieties), of which 615 are native and 154 are introduced species. We take this opportunity also of recording some new localities, of correcting several wrong identifications and of superseding certain specific names by others according to the rules of botanical nomenclature.

SELAGINELLACEAE.—*Sellaginella Preissiana* Spring, already recorded, also at Back Valley, Nov.

PINACEAE.—A single *Callitris*, with a well-developed butt and straight pole, evidently of considerable age, growing on the steep bank of the Hindmarsh half-a-mile from its mouth, may be indigenous and therefore *C. propinqua* R.Br. I do not know of any planted *Callitris* in the district from which seed may have come, though doubtless some have been planted.

POTAMOGETONACEAE. — *Potamogeton tricarinatus* A. Benn., swamps, Back Valley.

GRAMINEAE.—*Panicum effusum* R.Br., Back Valley, Nov.; **Setaria* sp., Victor Harbour, Jan.; **Phalaris tuberosa* L. (*Ph. nodosa* L.) in swamp ground behind Encounter Bay; *Stipa teretifolia* Steud., in large tussocks, cliffs near the sea, Waitpinga; **Oryzopsis miliacea* (L.) Aschers et Schweif., many-flowered Millet-grass, "Rice-grass," Encounter Bay; **Agrostis verticillata* Vill., Upper Middleton Creek, Jan.; *Deschampsia caespitosa* (L.) Beauv. var. *macrantha* Hackel., covering rocks in the stream at Upper Waterfall, Hindmarsh River, previously known in this State only from the South-East; *Poa caespitosa* Forst. var. *laevis*, Benth., Back Valley; *Glyceria fluitans* (L.) R.Br., Manna Grass, Hall's Creek, Oct.; *Festuca elatior* L. var. *arundinaceum* Hack., previously recorded, also at Hall's Creek, Nov.; *Brachystachium distachyum* R. et S., Nov.

CYPERACEAE.—*Schoenus tesquorum* J. M. Black, Hall's Creek, a new locality, type from the South-East, Nov.; [the name *Cladium rubiginosum* (Soland.) Domin replaces *C. glomeratum* R.Br., already recorded, Hall's Creek, Nov.]; *Carex pumila* Thunb. var. *Bichenoviana* Kukenth., already recorded, Back

Valley, Nov.; *Carex pseudocyperus* L., already recorded, Hall's Creek, Jan.

RESTIONACEAE.—*Leptocarpus tenax* R.Br., Upper Willow Creek (Waitpinga), in swamps, May; the record of *L. Brownii* Hook, is probably wrong, being based apparently on specimens of *Hypolaena fastigiata* R.Br. deformed by a fungus (smut) infestation.

LILIACEAE.—**Asparagus officinalis* L., asparagus, Upper Middleton Creek and Valley behind Port Elliot.

ORCHIDACEAE.—*Microtis parviflora* R.Br., no scent, Back Valley, Nov. (*M. porrifolia* Spreng, is scented); *M. atrata* Lindl., already recorded, Back Valley, Nov.; *Leptoceras fimbriata* Lindl., already recorded, Back Valley, May; *Diuris brevifolia* Rogers, already recorded, Back Valley, Nov.

SANTALACEAE.—A specimen of *Santalum lanceolatum* R.Br., a species known from north of Port Augusta and in the South Australian form resembling in habit *Pittosporum phillyreoides* DC., is in J.B.C.'s herbarium labelled "Waitpinga road." Recent search for it has been unsuccessful and perhaps the plant has been mislabelled.

LORANTHACEAE.—*Loranthus Exocarpi* Behr., red-flowered form, already recorded, has been found on *Casuarina stricta* Ait., near Port Elliot; on *Exocarpus cupressiformis* Labill., on *Acacia dodonaeifolia* (Pers.) Willd. and on *L. Miquelii* Lehm. which itself was on *Eucalyptus fasciculosa* F.v.M., all at Hindmarsh River, Jan.; and also on *Cystisus prolifer* L., Tagasaste, and *Acacia dodonaeifolia* (both yellow and red forms of the parasite) on the Inman Road near Victor Harbour, May; *L. pendulus* Sieb., already recorded, was found also on this Tagasaste as well as on adjacent *Eucalyptus rostrata* Schlecht.

CHENOPODIACEAE.—*Atriplex semibaccatum* R.Br., Berry Saltbush, mouth of Middleton Creek; *Bassia uniflora* (R.Br.) F.v.M., already recorded, forms some extensive mats, greyish-green to purplish in colour, between the granite rocks on the seaward face of the Bluff (Rosetta Head).

AMARANTACEAE.—The record of *Trichinium alopecuroideum* Lindl. is an error for *T. spathulatum* R.Br., the Bluff, Nov. The former plant has not yet been found in the district.

PORTULACACEAE.—*Claytonia australasica* Hook.f., swamps, Back Valley, Nov.

CRUCIFERAE.—**Sisymbrium officinale* L., Hedge Mustard; *Stenopetalum lineare* R.Br., petals brownish, one plant, sandhills, Encounter Bay.

GRASSULACEAE.—*Crassula bonariensis* (D.C.) Cambess., Back Valley, Nov.; *C. recurva* (Hook. f.) Ostenf., in damp soil, Back Valley, Jan.

LEGUMINOSAE.—*Acacia rhetinodes* Schlechtd., a variety with small hooked phyllodes growing in dry country at Waitpinga; *Pultenaea quadricolor* J. M. Black, a new species found at Back Valley, Nov., 1930; *P. teretifolia* H. B. Williamson, already recorded, stony hills, Upper Willow Creek; **Trifolium filiforme* L., Nov.; **T. resupinatum* L., Nov.; **T. striatum* L., Inman Valley; **Cystisus canariensis* (L.) Steud., Canary Broom, hills near Port Elliot.

MALVACEAE.—*Lavatera plebeja* Sims. var. *tomentosa* Hook.f., Wright's Island, Jan.

DILLENIACEAE.—*Hibbertia Billardieri* F.v.M., Upper Willow Creek (Waitpinga).

MYRTACEAE.—*Melaleuca fasciculiflora* Benth., already recorded, is common in the Inman River bed below Crozier's Hill.

HALORRHAGIDACEAE.—*Myriophyllum propinquum* A. Cunn. replaces *M. intermedium* D.C., already recorded, also at Willow Creek and Back Valley; *M. amphibium* Labill., in swamps, Upper Willow Creek, Jan.

EPACRIDACEAE.—*Leucopogon australis* R.Br., Upper Waterfall, Hindmarsh R. (previously included under *L. Richei* Labill.); *L. parviflorus* (Andr.) Lindl. replaces *L. Richei* Labill., already recorded, sandhills along the coast; *L. costatus* F.v.M., recorded in Black's Flora for Encounter Bay.

PRIMULACEAE.—*Centunculus minimus* L., Chaffweed, a minute plant with a circumsciss capsule, Back Valley, Nov.

LOGANIACEAE.—*Mitrasacme distylis* F.v.M., Back Valley, Nov.

GENTIANACEAE.—*Erythraea australis* R.Br., Back Valley, Inman Valley, Jan.

APOCYNACEAE.—*Alyxia buxifolia* R.Br.

LABIATAE.—*Scutellaria humilis* R.Br., already recorded, is common in Hall's Creek and Back Valley, May.

SOLANACEAE.—*Solanum aviculare* Forst.f., already recorded (doubtful), grows at Waitpinga.

SCROPHULARIACEAE.—*Veronica Derwentia* Andr., already recorded, also found at Hall's Creek.

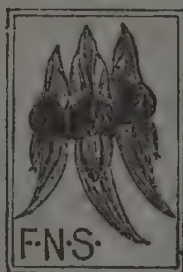
GOODENIACEAE.—*Goodenia primulacea* Schlechtd is now definitely recorded, Nov.; *G. affinis* De Vriese.

COMPOSITAE.—*Lagenophora stipitata* (Labill.) Druce, Back Valley, Nov.; the name *Vittadinia triloba* (Gaudich.) DC. replaces *V. australis* A. Rich. The variety *lanuginosa* J. M. Black is now recorded for Back Valley, Nov.; *Senecio Cunninghamii* DC., near Port Elliot, Jan.; *Senecio odoratus* Hornem (var. *obtusifolius* already recorded), banks of Hindmarsh River.

The South Australian Naturalist

The Journal of the Field Naturalists' Section of the Royal
Society of South Australia and of the South Australian
Aquarium Society.

Adelaide



Aug. 1932

Vol. XIII.

No. 4

CONTENTS.

—:o:—

Proceedings	121-126
South Australian Shells, Part V. (By Bernard C. Cotton and F. K. Godfrey)	127-176
Additions to our Library	176

The authors of papers are responsible for the facts
recorded and opinions expressed.

Address of the Section: C/o Royal Society's Rooms, Institute
Building, North Terrace, Adelaide.

Published Quarterly

Single Copy—NINEPENCE

Obtainable from Cole's Book Arcade, No. 14 Rundle Street,
Adelaide.

Felstead & Omsby, Printers, Delmont's Building, Anster Avenue, Adelaide.

The South Australian Naturalist.

VOL. XIII.

ADELAIDE, AUGUST, 1932.

No. 4.

PROCEEDINGS.

March, 1932. The monthly meeting, held on the 15th, took the form of a conversazione. Tea was partaken of in the Maple Leaf Cafe at 6 p.m., and the meeting followed. Mr. E. H. Ising, chairman of the Section, presided, and there were about 60 members present. Mrs. M. Kelsey opened by an overture, and the chairman welcomed the members and Mr. Chas. Barrett, C.M.Z.S., R.A.O.U., of Melbourne, the editor of the *Victorian Naturalist*. The chairman then made the following remarks:—

THE STUDY OF NATURE.

"Field Naturalists have illimitable scope in the many branches of natural history that they may study. From the telescope, which searches the heavens, to the microscope, which reveals a hidden world, the nature student has a range which has no bounds, and is packed with wonders. The only limit is that centred in ourselves, that is the ability to follow Nature's clues and the time we can devote to their pursuit.

Thus those whose feet have been guided along Nature's pathways have found them very pleasant indeed. Every avenue is open to the diligent seeker after Nature's secrets but those secrets are only revealed to those who are in harmony with Nature.

Some are fortunate in being able to travel along the many channels in Nature's way, others, and perhaps the majority can be considered in this category, can only tread the by-ways in the vast domain of natural science, but wherever our talents lead us we can find happiness and contentment which points the way to Nature's God.

We have before us to-night samples of Nature's gifts, but there are others and there seems no need to enumerate them, but any and all of them will repay close investigation.

I would urge all members to take up some branch of natural history and devote their time to it. These are the days of specialisation, but much may be gained by just a general interest in the natural sciences. Each member may choose the subject best fitted for them to study according to their gifts and time that can be devoted to it.

We are to have several lectures to-night dealing with Nature in varying aspects, and I trust that they will lead you all to a better appreciation of the beauties of our world in which we live."

During the evening the lecturettes were interspersed with the following items:—Songs by Miss Kennedy and Mr. A. W. Bennett. Mr. Barrett then gave a lantern lecture on the "Great Barrier Reef," which he visited with a party recently. A very fine series of slides enabled members to get beautiful glimpses of the variety of marine life to be seen along the Queensland coast. Mr. Barrett's descriptions of the scenery and the wonders of the reef entranced his audience, and he was sincerely thanked for his exceptional lecture.

Mr. J. F. Bailey spoke on some native plants growing in the Botanic Gardens.

Mr. F. K. Godfrey, chairman of the Malacological Society of S.A., then gave an instructive lecturette on Shells, and made special reference to the first growth of the shell, and illustrated his remarks by a number of specimens.

Mr. W. A. Harding, chairman of the Microscope Committee, made an appeal for workers in microscopical science and, assisted by the loan of a valuable and useful range of instruments from Messrs. Laubman and Pank Ltd., explained their use for various work.

NEW MEMBERS.

April, 1932. The monthly meeting was held in the Royal Society's rooms on the 19th April, when Mr. W. A. Harding presided over a good attendance of members.

The lecture for the evening was given by Prof. J. B. Cleland, M.D., on "Natural History Notes."

By means of specimens and interesting information concerning them, the lecturer kept his hearers' attention through the lecture. Prof. Cleland's wonderful range of knowledge of natural history, especially in botany, fungi, and bird life, always assures our members correct and up-to-date information.

NEW MEMBERS.

May, 1932. The monthly meeting was held in the Royal Society's rooms on the 17th May, at 7.30 p.m., the chairman, Mr. E. H. Ising, presiding. About 40 members and friends were present.

NOMINATIONS.

Dr. H. Kenneth Fry, D.S.O., and Mr. J. Fry, Eastwood, were nominated by Mr. E. V. Dix, and Mr. H. H. Finlayson, University, Adelaide, was nominated by Prof. Cleland as members.

REPORT.

Messrs. A. J. Morrison and W. Champion Hackett reported that they had attended a recent meeting of the Field Naturalists' Club of Victoria in Melbourne, and that they had been heartily welcomed.

LECTURE.

Mr. E. E. Pescott, F.L.S., F.R.H.S., a past president of the Victorian Field Naturalists' Club, gave a lantern lecture on "Australian Orchids." Mr. Pescott is a notable Victorian botanist and is the author of several botanical works, not least among them being the one on "Victorian Orchids." The lecturer has made an intensive study of this fascinating group of plants, and he is considered to be one of the leading authorities on these flowers. His remarks, therefore, were listened to most intently, as, with the aid of a large series of beautiful slides, he made the evening a memorable one to our members.

PROCEEDINGS.

June, 1932. The monthly meeting was held in the Institute Lecture Room on the 21st June, when the chairman, Mr. E. H. Ising, presided. The opportunity was taken of saying farewell to Mr. J. F. Bailey. A large number of long-standing members and others were present.

FAREWELL to Mr. J. F. BAILEY, FORMER DIRECTOR

Mr. Bailey was appointed Director of the Gardens in 1915, and he brought a wealth of experience with him and used it to good purpose in our public domain. The Garden was always looking well when it ought to be looking well. It was a great credit to the director's organisation and design, and he may leave us conscious that his work was appreciated by the citizens of our fair city.

The chairman (Mr. E. H. Ising) expressed the sorrow of the members at losing Mr. Bailey. He said: "We shall always remember the pleasant afternoons when we have been escorted around the Garden by Mr. Bailey. From his inexhaustible fund of knowledge of the trees and plants growing within the reserve he was always able to give us an instructive and enjoyable afternoon. In fact our visits were always rewarded by real lectures, practical in the extreme, because the subjects of his remarks were pointed out to us.

"Mr. Bailey gave up his own time on these occasions for our benefit, and he was always ready and willing to do this, no matter how often we asked to see the Gardens, and our visits were usually an annual fixture. We shall always remember Mr. Bailey's wit and good humor with which he administered the

large doses of botanical appellations. His love of trees and plants, and his own genial way of imparting knowledge, made us love those trees and shrubs, too. Personally, I enjoyed every visit to the Gardens, and I feel sure that we all did. We cannot exhaust the interest contained in the Gardens, but our future rambles in that domain will bring back the memories of the happy times we have spent there with our friend.

"The visits we paid to the Type Orchard at Mylor were also rewarded by the same happy method of enlightening those who had the good fortune to go.

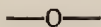
"The lectures given by our host will be remembered and long appreciated. I mention particularly those on Orchids and Palms and Cycads. In those and all other lectures and talks, we were always treated to the fullest and latest information with regard to the subject brought forward. Mr. Bailey's comments on the slides at his lectures were always enlightening, and given in that inimitable way of his, we could not help but carry away very pleasant memories of them and him.

"Mr. Bailey, we regret in no ordinary manner the necessity of your going away, and only wish that you could stay with us. But, seeing that the step has to be taken, and that not even the offering of the honorary position of Director of the Wild Flower Shows will keep you here, we reluctantly say farewell.

"We heartily and sincerely thank you for all the help, instruction, advice and good fellowship that you have so freely given us during all the years that you have been here.

"May God bless you and yours in your new home."

Other members also spoke, and Mr. Bailey suitably responded.



LECTURE.

Before introducing the lecturer, the chairman extended a very cordial welcome on behalf of the committee to members of the Institute of Public Administration, represented by members of the Council as follow:—

The following were present:— G. E. Willson, Esq., Commonwealth Public Service Inspector; Brig.-Gen. S. Price Weir, D.S.O., V.D.; H. M. Rolland, Esq., O.B.E., F.R.V.I.A., Commonwealth Works Director; V. E. R. Dumas, Esq., Registrar-General of Deeds; A. L. Read, Esq., Under Secretary; C. G. Lewis, Esq., A.C.U.A., F.A.I.S., Secretary to the Director of Education

The chairman also welcomed the members of the S.A. Anglers' Association.

The chairman, in introducing the lecturer, said: "Prof. Johnston accompanied Sir Douglas Mawson on his last two trips to the Antarctic, and was second in command. He had attained high scientific qualifications before going "South" and more particularly in connection with the control and eradication of the prickly pear in Queensland. He was chosen to visit other parts of the world, Mexico chiefly, to study the life and habits of this pest and eventually he was able to decide on the natural enemy of the pest pear and to introduce it to Australia. That was only the first step, as the insect, on which the hopes of the eradication of the prickly pear were based, had to be proved of being incapable of attacking other plant growth, native and cultivated, in our continent. After a long series of tests it was found that the insect would live only on the pear. It was then hatched in thousands for the work of killing the pest. To say that the introduction of this tiny organism was or has been successful is stating it too mildly, as it is doing its work in a most amazing manner, and will be the means of restoring those millions of acres that were thought to be lost beyond recall.

"But it was as a result of Prof. Johnston's work in the Antarctic that his name was made more eminent still. All the training in the scientific field was brought to bear on the problems 'down South,' and there he was able to carry out accurate observations in connection with deep sea life, and other allied subjects.

"The hardships and dangers did not deter our lecturer from offering the second time, and we honour him for the work he was able to do. As Prof. Johnston is president of the Royal Society, it gives me added pleasure in welcoming you, as the chairman of your Field Nationalist' Section. We greatly feel the honour you have conferred on us by giving your time and instruction on this occasion."

The lecturer kept the audience spell-bound for an hour and a half with a large number of unique slides and commentaries that were instructive and educational to a high degree.

The lecture was on "Whales and Whaling in the Antarctic."

Mr. H. M. Rolland proposed a vote of thanks. Mr. F. J. Nottage, vice-president of the S.A. Anglers' Association, seconded the motion, which was supported by Mr. F. J. Cunningham, who concluded his remarks by two verses of rhyme. The vote of thanks was carried heartily by all present.

NOMINATIONS.

Mr. K. Cotton, South Payneham, and Mr. E. A. Mann, Bank of Adelaide, King William Street, were nominated by Mr. E. H. Ising.

NEW MEMBERS.

On a ballot being taken, Dr. H. K. Fry, Mr. J. Fry, and Mr. H. H. Finlayson were elected members.

LECTURE.

The lecture for the evening was given by Sir Douglas Mawson, F.R.S., D.Sc. etc., on "New Zealand Glaciers." In introducing the lecturer the chairman said that "it seemed superfluous to introduce such a well-known and prominent member of the South Australian scientific fraternity. In fact, I may safely say that Sir Douglas has won world-wide renown for his attainments in the scientific sphere for the honour of having the title of F.R.S. denotes that. But it is in the fascinating realm of discovery, where personal force of character, determination to succeed, and ability for hard work with a life governed by right and high motives, where Sir Douglas has gained such eminence. I believe that it was Stefansson who said that our lecturer is the *greatest living explorer*. (Applause.)

"We believe that, for we all have been thrilled with the accounts of the exploits of Sir Douglas in the frozen region of the South, and have marvelled at the endurance, fortitude, and tenacity of purpose which has been exhibited by him."

The lecturer's remarks were concerned with the striking glaciers of the Southern Alps, and the slides depicting the scenery in this mountainous region of the South Island were wonderfully good.

Before the lecture the chairman gave a cordial welcome to all present and specially to the members of the Institute of Public Administration, among whom were Mr. V. E. R. Dumas and Mr. C. G. Lewis, members of Council. The former proposed a vote of thanks to Sir Douglas Mawson, which was seconded by Mr. H. M. Hale, and carried by acclamation.

PROCEEDINGS.

July, 1932. The monthly meeting was held in the Institute Lecture Room on the 19th July, at 7.30 p.m., when the chairman, Mr. E. H. Ising, presided over a large attendance of members and friends.

NEW MEMBERS.

On a ballot being taken Messrs. E. A. Mann and K. Cotton were elected members.

NOMINATION.

Mr. H. J. Dart, 15 Clark Street, Wayville, was nominated by Mr. E. H. Ising.

SOUTH AUSTRALIAN SHELLS.

(Including descriptions of New Genera and Species).

PART V.

By BERNARD C. COTTON and F. K. GODFREY.

In this part the following families are treated:—

Muricidae, Thaididae, Ellobiidae, Amphibolidae, Siphonariidae,
Limnaeidae, Planorbidae, Ancyliidae, Pupillidae, Succineidae,
Helicidae and Rhytididae.

MURICIDAE.

Spindle-shaped, spire moderately long; axial ribs, spinous or leaf-like; canal elongate, sometimes closed by the approachment of the opposite margins. Operculum ovate, horny, nucleus almost or quite terminal. Distribution—World-wide, tropical or temperate, ranging from low water to moderate depths. Fossil—Cretaceous.

Animal with a moderately long foot, truncated in front; tentacles elongate, bearing eyes high up on the sides. Carnivorous, feeding on Gastropods and Pelecypods, whose shell they pierce with the radula, forming a round hole, through which they insert their long proboscis. Sexes separate. In Europe, *Murex* (*Ocinebra*) *erinaceus* Linne is considered one of the most dangerous enemies the oyster-farmer has to deal with, and much time is given to its destruction. The depredator settles upon the shell of the oyster near the umbo, and for three or four hours the radula rasps a hole. The bored oyster soon dies or else, exhausted, the adductor muscle ceases to function and the valves open, thereby admitting other animal robbers who are quick to profit by the labour of the *Murex*. The purple of the ancients was obtained from *Murex* (*Rhinocantha*) *brandaris* Linne and *M. trunculus* Linne. The small shells were bruised in mortars, the animals of the larger ones taken out. On the Tyrian shore are heaps of broken shells and the caldron-shaped holes in the rocks where they are triturated. The pigment, contained in cells of the mantle, is colourless or yellowish, but under the influence of light turns yellow, green, blue and then purple. The dye can be fixed upon fibres without the help of a mordant, and the colour is brilliant and solid. *M. brandaris* and *trunculus* are sold for food in the markets on the coast of the Adriatic. Many species in this family are commonly known as "Rock-shells," from the roughness and irregularity of their surface. They abound

in shallow waters and are often covered by extraneous marine substances. The different periods of their growth, or rather of their enlargement by the animal, are marked off by thickened ribs called varices. The shells, especially from tropical waters, are frequently brilliantly coloured, and the elaborate structure, the ramifications of the spiny, branched, or fringed varices, have established them as favourites with collectors. *Murex tenuispina* Lamarck "The Comb of Venus," also called "The Slender-spined Murex," with its long canal and long rows of slender parallel spines, is found in Northern Australia, but there is no spiny species (typical Murex) at present living in Southern Australia. "The Scorpion Murex," *M. (Homalocanthus) scorpio* Linne, with the varix in fronds having dilated apices, inhabits the Eastern Archipelago. *M. (Muricanthus) radix* Gmelin, from Panama, has fine black, short spines. The "Royal Murex," *M. (Phyllorotus) regius* Wood, from Panama, has a brilliant crimson mouth. The "Branching Murex," *M. (Chicoreus) ramosus* Linne, from the Barrier Reef, has the inside of the mouth a delicate flesh-pink. The "Stag-horn Murex," *M. (Chicoreus) cervicornis* Lamarck, from Northern Australia has forked points at its larger fronds. *M. (Chicoreus) palma-rosae* Lamarck, from Ceylon has tinted tips of finely toothed fronds. *M. (Haustellum) haustellum* Linne, from China, has a very long canal, and but a few short spines which are placed along the canal. These are nearly all large shells. The largest representative of the family in South Australia is *Pteronotus triformis* Reeve, a "Rock Shell."

Chicoreus Montfort. Triangularly ovate; varices three, foliated and sometimes spinose; canal as long as the mouth, curved, wide, nearly closed. Type—*Murex ramosus* Linne.

C. denudatus Perry 1811 (*Triplex*) (= *Murex australis* Quoy & Gaimard 1833: = *M. palmiferus* Sowerby 1840). Pinkish-brown or white; spire rather elongated, pointed, turreted; spirally ridged and striated, two prominent tubercles between the varices; varices three, somewhat thickened, with a single row of short, rather compressed folds, often fimbriately connected at the side; whorls somewhat ventricose; outer lip denticulated; canal of medium length, recurved. Height 36; diam. 20 mm. Subfossil in South Australia. Largs Bay, two examples from shell debris (Henn). Alive in North Australia. Gatliff recorded this from Victoria as *Murex abortivus* Perry, a different species. *C. denudatus* is recognised by its short compressed fronds, which are usually so close side by side, as to form a connected leaf-like frill. (Type locality—Van Dieman's Land [Perry in error] North Australia).

Pteronotus Swainson 1833 (= *Pteropurpura* Jousseaume 1879: = *Poropteron* Jousseaume 1879. *Poropteron* is regarded by some as a sub-genus). Triangular, varices three, fin-like or leaf-like; spire elevated; whorls rounded; mouth ovate; outer lip generally simple, but sometimes crenulated; canal somewhat curved, nearly closed; operculum horny, ovate, with nucleus scarcely terminal. Type—*Murex pinnatus* Swainson, not of Wood. (China).

P. triformis Reeve 1845 (*Murex*) (= *M. zonatus* Tenison-Woods 1876). Pl 1, fig. 2. "The Common Rock-shell." Angularly elongate, triangular, spire two-fifths of the length of body-whorl; brownish, usually increasing to deep purple; some are creamy white; inside white; closely spirally striated, the grooves ending in a frill on the three varices; whorls six, angulated towards the upper part and with two or more nodules between the varices; varices with a single open projection or spine posteriorly, both on the spire and body whorls, in a line with the nodules; on perfect specimens there is a curved spine of varying length medially to and on the left of the canal; mouth ovate, but sinuating considerably above, near the outer lip, which is finely crenate; inner lip smooth, spreading over the columella; canal somewhat long, not quite closed, and usually increasingly open towards the lower end which is strongly recurved. Height 97, diam. 56 mm. Generally distributed throughout South Australia, beach, and dredged to 100 fathoms, alive to 22 fathoms, rather common. Also Western Australia, west to Bunbury, down to 15 fathoms; Victoria; Tasmania, where the specimens are much smaller. (Type locality—New Holland). An attractive shell when in good condition. The varices form a frill nearly the whole length of the shell, which is especially conspicuous on the margin of the outer lip, and, in good specimens, the recurved canal becomes hook-like. This species is better placed here than under *Pterochelus* Jousseaume, which we regard as a synonym.

P. angasi Crosse 1863 (*Typhis*) (= *Murex cordis mei* Watson 1886). Pl. 1., fig. 1. "Angas' Pteronotus." Trigonal, elongate, rather thin, nearly translucent; light yellow, with a violet band, also violet at the suture, (an exceptional specimen is blackish-purple, with a central white band over the body-whorl and over the lower half of the outer lip and the columella and inner border of the canal, so that the upper third of the varix is purple, and the lower two-thirds white); whorls about six; varices three, leaf-like slightly discontinuous, rising at the shoulder into semitubular, upturned, and slightly reverted spines; two minute, rounded tubercles between the spines; also a tube-like spine curved downwards and outwards; to the left of the

middle of the beak, frequently wanting in beach specimens; mouth roundly oval, small, white within, with two violet bands; outer lip widely foliated; columella curved, white; canal slightly oblique, recurved. Height 23, diam. 11.5 mm. General, beach to 110 fathoms, alive down to 12 fathoms. Uncommon. Also Esperance beach, W.A. (Type locality—Port Jackson). Peronian specimens are less stout, and the spurs are white, with a light purple-brown band at the middle of the body whorl, spreading at the outer lip. *P. angasi* has the general appearance of young *P. triformis*, but the varices at their juncture with the suture are very canaliculate and much hooked backwards. The New Zealand *Pteronotus eos* Hutton 1873, once considered identical, is now regarded as a different species.

P. robustus Verco 1895 (*Murex* [*Poropteron*]). "The Robust Pteronotus." Ovate, trigonal, solid, spire a little shorter than the body-whorl; yellowish-white (very young specimens have two chestnut spiral lines); protoconch of one-and-a-half turns, slightly papillate; adult whorls six, scarcely convex, nearly smooth on the spire whorls; body-whorl rather rugged, with five or six faint spiral lirae, and very fine growth lines; varices three, low and stout, ending close to the suture in a tube, trigonal in section, stout and sinuous, like a horn, extending backwards, hollow, rugged; sutures distinct; mouth oval, slightly oblique, small, entire; peristome projecting as a thin, detached, simple, sharp lamina; six rounded, tubular, spiral ribs, extending on the outside of the outer lip to the margin of the varix (the counterpart of the short, stout, spiral buttresses on the left side of the varices on the spire); columella invisible; canal completely closed, just longer than the mouth, at its lower end bent at a right angle and then curved slightly to the right, with a capillary opening from a little behind the bend to the extremity, the labial varix saw-like, with nine claw-like processes; operculum horny, ovate, nucleus terminal below. Height 14.25, diam. 7 mm. Rare. (Type locality—Backstairs Passage, 22 fathoms); Gulf St. Vincent, depth uncertain. Superficially it resembles *P. angasi* which is a narrower, thinner shell, with a single curved (not sinuous) and open posterior variccal hook, an open anterior canal, and a simple mouth.

P. tatei Verco 1895 (*Murex*). "Tate's Pteronotus." Squarely pear-shaped, light, porous; greyish-white; partly reddish-brown inside, indistinctly visible without; spiral lirae, six on the penultimate whorl, crossed by regular, thin, close-set, axial laminae producing a coral-like effect; varices five, not quite regularly disposed, well-marked, rather wider than high, rounded and slightly reflected, most prominent above the shoulder; spire less

than one-third the length of the shell; protoconch conspicuous, papillate, of one-and-a-half turns, smooth, purplish-black, suture somewhat channelled; adult whorls four, convex, roundly shouldered above; mouth obliquely oval; outer lip simple, finely crenulated, and lirate within, thickened outside; inner lip distinct on the curved columella; canal slightly longer than the mouth, deflected first to the left, then straight, then to the left, almost closed, and sharply recurved at the anterior extremity; operculum horny, nucleus terminal below. Height 15, diam. 9.5 mm. Rare. (Type locality—Backstairs Passage, 17-22 fathoms).

Murexsul Iredale 1914. Ovate, sometimes narrowly umbilicated, axially ribbed, tending to develop varices carrying hollow spines on the body-whorl; spiral ribs numerous, narrow, rounded; spire conical, gradate, rather higher than the mouth; protoconch small, of barely two whorls, smooth, flat vertically, topped by a fairly sharp keel, the summit a marked pit, the tip being rather immersed; mouth ovate; outer lip angled above; canal moderate, oblique, recurved, narrowly open; umbilicus narrow, distinct; operculum horny, with nucleus scarcely terminal. Type—*Murex octogonus* Quoy & Gaimard 1833 (New Zealand).

M. umbilicatus Tenison-Woods 1875 (*Trophon*). Pl. 1, fig. 3. "The Umbilicated *Murexsul*." Ovate, solid, spire raised; yellow or pale chestnut; conspicuously axially ribbed, eight in last whorl, the axial ribs cut across by numerous thick spiral lirae, having a rugged, scaly effect; outer lip crenulate outside and toothed within; inner lip expanded; umbilicus margined with rounded, imbricated scales. Height 28, diam. 20 mm. Guichen Bay to Gulf St. Vincent, Spencer Gulf, St. Francis Island. Beach and dredged to 20 fathoms. Rather uncommon. Also dredged off Esperance, W.A. (Type locality—E. coast of Tasmania). *M. umbilicatus* is distinct from *M. octogonus*, a New Zealand shell, with which it has been confused.

M. brazieri Angas 1877 (*Murex*) (= *Trophon tumidus* Petterd 1884). "Brazil's *Murexsul*." Ovate, solid, not umbilicated; light-brown, tinged with brownish-purple on the columella and within the mouth; varices six, irregular; spiral ribs strong, erect, five on the last whorl, some of the ribs are double, crossed axially with squamate ridges throughout, which are nodulous on the ribs, and become more foliaceous towards the base; whorls five, somewhat excavated and flattened above; outer lip dentate within; canal, half the length of mouth, slightly recurved. Height 11, diam. 6 mm. All round the South Australian Coast, beach and dredged to 150 fathoms. Not common. Also Western Australia where they are apparently as numerous on the West Coast as on the South. Albany to Fremantle, beach to 22 fathoms. (Type locality—Port Jackson Heads 20 fathoms).

M. fimbriatus Lamarck 1822 (*Murex*) (= *M. planiliratus* Reeve 1845: = *M. polypleurus* Brazier 1894: not *M. pumilus* A. Adams 1853 from the China Seas). "The Fimbriated *Murex*-sul." Small, spindle-shaped, not umbilicated; somewhat grey, or flesh coloured; varices eight, continuous, crossed by fine spiral lirae, the interstices very finely striate, or scabrous; whorls about five, bluntly angulated; suture slightly impressed, smooth; mouth oval, attenuated below; outer lip thickened by the external varix, with five to six small nodose teeth within; inner lip with one small rounded tooth near the canal. Height 15, diam. 10 mm. Generally distributed, South Australia, beach and dredged to 110 fathoms. Not common. Also Western Australia, west to Rottnest Island, beach and down to 28 fathoms. (Type locality—King George Sound). Formerly confused with *M. pumilus* A. Adams, which is narrower and much shorter, having the canal slightly turned up and crossed by scabrous spiral ridges. We doubt whether this shell differs specifically from *M. brazieri*.

The single living specimen said to be the Mediterranean *Murex serotinus* A. Adams taken alive at Aldinga Bay is probably *M. fimbriatus*.

Galfridus Iredale 1924. Ovately spindle-shaped, with rounded whorls, and false umbilicus; lamelliform axials and fine crowded spirals; protoconch of two turns, closely spirally lirate; suture impressed; mouth rather large; outer lip thin, with a notch close to the suture; canal short, open; operculum horny. Type—*Triton speciosus* Angas 1871. (N.S.W.).

G. eburneus Petterd 1884 (*Trophon*) (= *Daphnella eburnea* Petterd (Verco): = *Tritonidea eburnea* Petterd (Adcock): not *G. speciosus* Angas 1871 [*Triton*] from N.S.W.). "The Ivory-white Galfridus." White, dull; growth lines irregular, lamellar, making a frill immediately below the suture, corresponding with a small round sinus there; spirals fine, crowded; spire less than half the height of the mouth; protoconch two-whorled, with twelve spirals; adults whorls about three, rounded; the false umbilicus, which is absent from young shells, is only a separation of the lower part of the inner lip from the sinistral twist of the extremity of the columella. Height 14, diam. 7 mm. Beach, Port Willunga, Fowler Bay, Venus Bay, St. Francis Island, and dredged Backstairs Passage, 17 fathoms. Rather rare. (Type locality—Tamar Heads, Tasmania). Occurs also in Tasmania and Victoria. *G. eburneus* is smoother and thinner than *speciosus*, and the thick varices of the latter are reduced in *eburneus* to mere lines of growth. *G. eburneus* is the Flindersian shell.

Typhis Montfort 1810 (from typhos, smoke) (= *Typhina* Jousseame 1879). Small, oval-oblong, varices spinose, usually four, and projecting hollow tubes between them; tubes formed by a fold, the edges of which are appressed so closely that the shelly secretion forms a perfect cylinder; in some species the varix commences with, and at the tube, though mostly developed beyond it; spire elevated; mouth rounded; peristome continuous; columella smooth; canal short, tubular; operculum oval, nucleus terminal. Type *Murex tubifer* Bruguiere, an Eocene fossil. (The type of *Typhina* is *Typhis belcheri* Broderip, from N.S.W.) The last tubular spine is lined by a prolongation of the mantle-margin of the animal, and is the regular outlet for effete matter, as the earlier formed tubes have been successively. The same remark applies to the last perforation in the shell of *Haliotis* (Mutton Fish). The tubes are of greatest length when first formed, later they seem either to be partly dissolved or broken off. The last tube, until it is broken, is therefore always longer than the others. Specimens from deep water occasionally preserve the tubes, or part of them, in a way to make this evident.

T. yatesi Crosse 1865. Pl. 1, fig. 6. "Yates' Typhis." Rather thin, scarcely translucent; white, slightly tinged with pink; whorls six, each whorl with four varices, wavy, compressed, jagged, ending in a hollow spine, pointed and recurved when it is intact; the space between the varices presents a projecting tube, with a rounded aperture; last whorl narrowed at the base, longer than the spire; mouth small, roundly-oval, entire, white, peristome projecting, detached, simple, sharp; canal completely closed throughout, rather wide, slightly oblique and recurved. The largest specimen, from Gulf St. Vincent, height 24, diam. 13 mm.; specimen illustrated measures, height 18, diam 9.5 mm. Beach, Grange, Semaphore, Outer Harbour, Stansbury. Dredged, Beachport to Port Lincoln, 9-40 fathoms. Also Western Australia—Bunbury, 22 fathoms, one alive, rather short in the spire. Somewhat rare. (Type locality—Gulf St. Vincent). Distinguished by the elegant denticulation of the varices.

Cyphonochelus Jousseame 1879. Small, ovate, whorls shelved at the shoulder; many double varices, each composed of two evenly spaced elevated folds which fuse at the base, and, uniting in an arch above, project as a short, somewhat bent pipe, at the shoulder; protoconch of one-and-a-half turns, elevated, smooth; canal short, hardly curved, narrowly open. Type—*Typhis arcuatus* Hinds (South Africa).

C. syringianus Hedley 1903 (*Typhis*) (not *Typhis arcuatus* Hinds 1843, from South Africa). Pl. 1, fig. 5. "The Piped Cyphonochelus." Rather solid; pale brown; altogether 20 double varices, united at the outer edge in a curve and terminating in

a short, backwardly bent pipe, at the shoulder; in the hollow between each double varix occurs the scar of the former mouth; growth lines, fine, extend over the whole surface; whorls five; mouth oval, peristome continuous, produced within the varix; canal short, hardly curved. Height 9, diam. 5.5 mm. Dredged Cape Jaffa 130 fathoms, Beachport 200 fathoms, 35 miles S.W. of Neptune Islands 104 fathoms. (Type locality—Cape Three Points, N.S.W., 41-50 fathoms). Varies somewhat in the length of spire so that some are much more elate than others, also in the prominence of the axial costae going to and between the tubes. It has been mistaken for *Typhis arcuatus* Hinds 1843, a South African shell, which is considerably larger, has fewer and less upright folds, a longer and more curved canal, brighter colour and more prominent protoconch. *C. syringianus* differs from *Typhis yatesi* in being smaller, and in its double varices, which contain fewer and differently shaped denticulations.

C. bivaricatus Verco 1909 (*Typhis*). White, tinged with brown below the suture and the periphery; each spire whorl bears four projecting tubes with a rounded aperture; between these are double varices, the more prominent leaf midway between the tubes, the other just behind a tube; each leaf is flexuous and tridentate, and ends behind in a hollow-pointed recurved spine, from the narrowed base of the body-whorl projects the ends of three canals, towards each of which the two leaves of a varix converge to unite; mouth roundly oval, small, entire, peristome projecting, detached, simple, sharp; canal completely closed, wide, oblique, recurved; tube long, round, curved. Height 5.5, diam. 2.6 mm. (Type locality—35 miles S.W. of Neptune Islands, 104 fathoms, 20 examples dead). Probably the juvenile of *C. syringianus*.

Litozamia Iredale 1929. Small, spindle-shaped, turreted; axial ribs, rounded, crossed by spiral lirae; spire well raised; protoconch of about two-and-a-half whorls, smoothly granular, flat-topped and flat-sided, united at a right angle; adult whorls convex; mouth ovate, oblique; outer lip usually rather thick, slightly variced behind; canal short, curved. Type—*Peristernia rudolphi* Brazier 1894 (from Green Point, Watson's Bay, Sydney, N.S.W.). Distinguished by the short fusiform shape, moderate canal and smooth protoconch.

L. rudolphi Brazier 1894 (*Peristernia*). Pl. 1, fig. 8. "Rudolph's Litozamia." Yellowish-brown, with large dark reddish-brown spots below the suture and nearly on the angle of the whorls; axial ribs, rather wider than the interspaces, rounded, crossed by numerous spiral lirae, very conspicuous on the edge of the ribs, finer between and at the sides; three to four small nodules within the outer lip. Height 6.5, diam. 4 mm. Off

Beachport, 40-110 fathoms, Cape Borda 55 fathoms, rare. Also Western Australia, beach, Hopetown, Albany, Ellensbrook, Yallingup, Rottnest Island. (Type locality—Green Point, Watson's Bay, Sydney, N.S.W.).

L. goldsteini Tenison-Woods 1875 (*Trophon*). "Goldstein's *Litozamia*." Short; chalky-white; distant, scarcely raised spiral lirae (four in last whorl) do not pass over the axial ribs which are scaly and flexuous anteriorly; adult whorls six, convex, angulate and coronate above; mouth ovate, enamelled, and chestnut-brown banded within; columella twisted; canal twisted, flexuous. Height 16, diam. 8 m.m. General in South Australia but not common—beach to 150 fathoms. (Type locality—Long Bay, Tasmania). Some shells, dredged Gulf St. Vincent, are smaller, and with less prominent spiral lirae. The shell of *L. goldsteini* is composed of two distinct layers, an inner enamel-like foundation and an outer dull white, loose textured, soft chalk-like coating. In beach-rolled specimens this is more or less removed, leaving only the hard shining enamel-like basis, which shows numerous spiral threadlets besides the few scarcely raised spiral lirae. After comparison with shells in the British Museum this species appears closely allied to *Murex distinctus* Cristófer, from the Mediterranean; another shell *M. scalaroides* Blainville from Naples in the British Museum is almost certainly identical with *distinctus*.

L. brazieri Tenison-Woods 1875 (*Trophon*). "Brazier's *Litozamia*." Ovately spindle-shaped, attenuate at both ends; dull white; varices, six on the last whorl, strong, rib-like, convex in the middle; smooth or finely striate; spire scarcely turreted, almost acute; adult whorls about five; mouth ovate, enamelled chestnut; outer lip thin, indistinctly brown-banded within; columella somewhat tuberculate below; canal subelongate, recurved. Height 10, diam. 5mm. Macdonnell Bay, not common. More common Victoria and Tasmania. (Type locality—Long Bay, Tasmania). The enamelled chestnut mouth and narrow form easily distinguish it.

L. angusta Verco 1895 (*Trophon*). "The Narrow *Litozamia*." Spindle-shaped; dull white; varices, six, slightly higher than wide, sinuous; spiral lirae, slightly raised, broad, about five on last whorl, with two to five intervariceal axial lirae, dividing the intervariceal areas into squares of varying size; protoconch of one turn and a half, smooth, polished, blunt; adult whorls about five, slightly convex; mouth elongate-ovate, enamelled internally; outer lip varicose; columella curved, distinctly angled at junction with canal which is moderately open, reflected, notched. Height 10, diam. 4.25 mm. Rare. Gulf St. Vincent, deep water; Back-

stairs Passage 17 fathoms. Also Rottnest Island, W.A. (Type locality—Gulf St. Vincent, deep water). The shell has an inner hard enamel-like layer, and an outer of soft, porous, chalky consistence, much like *L. goldsteini* Tenison-Woods; otherwise it is more slender, with varices more curved, closer, whorls less angulate, less ventricose.

L. longior Verco 1909 (*Trophon*). "The Attenuate Litozamia." Narrowly spindle-shaped; white, just tinted with brown; deeply scorched spirally on the axial ribs near the suture, and in the body-whorl just below the periphery; axial ribs, bold, eleven in the penultimate, rather wider than the interspaces, round, extending from the suture which they undulate to the canal, whose varix they scale; spirals, four in the penultimate, three in the earlier whorls, nine in the body-whorl, round, crossing the axials; protoconch of two-and-a-half whorls, smoothly granular, ending by a distinct scar; first whorl with two keels, of which the highest continues as a sharp-corded angulation through the embryonic whorls, the lower fades out on the first whorl; adult whorls four and a half, convex; outer lip thin, simple; columella angled at its junction with the canal; inner lip thin, erect anteriorly; canal nearly as long as the obliquely oval mouth, directed obliquely to the left, concave to the right, slightly recurved. Height 6.4, diam. 2.7 mm. (Type locality—off Beachport, 40 fathoms, two examples). Also Ellensbrook, W.A., beach, two immature, one having a bright reddish-brown dot at the apex of the protoconch. Resembles *L. rudolphi* Brazier in its type of protoconch, but is longer, and narrower, and has its axials and spirals not so broad and close-set.

Benthoxystus Iredale 1929. Elongate, roughened by the profuse sculptural decoration; varices thin, scalloped by the spirals, and developing sharp points on the shoulder; protoconch of two-and-a-half whorls, long, conical, smooth, mouth oval, shielded by the youngest varix; columella excavate; canal short, wide. Type—*Trophon columnarius* Hedley 1908. Distinguished by its frilled axial laminae, very long spire, very long protoconch and short canal.

B. columnarius Hedley & May 1908 (*Trophon*). Pl. 1 fig. 9. "The Pillar-like Benthoxystus." Pale yellow, with brown on the protoconch, a basal and sutural band; varices thin, projecting, nine to a whorl, scalloped by the spirals, and with sharp points on the shoulder; varices almost vanish on the base; spirals, twelve on the body-whorl, crowded on the base; very faint axial threads and fainter spiral scratches between the varices. Height 20, diam. 8mm. Dredged Beachport, Cape Jaffa 40-200 fathoms;

Gulf St. Vincent, depth not recorded. (Type locality—100 fathoms off Cape Pillar, Tasmania). Some specimens show a spiral band about the middle of the shell, and another halfway between this and the protoconch, less opaque than the rest of the shell, and they are sometimes constricted along these lines and swollen between them.

B. petterdi (Brazier M.S.) Crosse 1870 (*Trophon*) (= *Trophon clathratus* Tenison-Woods 1875). "Petterd's Benthoxystus." Dull, yellowish-white, light yellowish within the mouth; there may be colour bands, just below the suture, centre of last whorl, and round the base, or there may only be the lower two, or only the lowest; axial rib-like varices, rounded, crossed by spirals, almost producing a trellised effect; protoconch, first one-and-a-half whorls smooth, last whorl with a faint spiral, ending in a scar; adult whorls four, convex; mouth ovate; the variced outer lip having a few denticles within; canal short. Height 9, diam. 4 mm. General in South Australia, beach to 200 fathoms. Not uncommon. Middleton specimens are rather larger and more robust than most. (Type locality—Tasmania, North). A cancellated shell, yellowish-white, almost shading to brown.

B. recurvatus Verco 1909 (*Trophon*). "The Recurved Benthoxystus." Fairly solid, sharply angulate; uniform light-horn; axial lamellae, thirteen in the penultimate, folded into prominent scales at the angle, also in the body-whorl, at a spiral cord (which starts at the suture from the back of the aperture, runs round the base, and angulates the outer lip) and then crenated, run over three obsolete spirals winding round the base, and finally bend in turn to the right over the back of the canal; protoconch, prominent, conical, of two-and-a-half smooth, convex turns, separated by a deep suture, apex curiously outstanding; adult whorls four-and-a-half, swollen, sharply angulate just above the middle; base rapidly contracted; sutures oblique, mouth roundly oval; outer lip thickened, equidistantly biangulate; canal about as long as the mouth, markedly recurved. Height 6.7, diam. 3.6 mm. (Type locality—200 fathoms, off Beachport).

Apixystus Iredale 1929. Ovately spindle-shaped; varices close, frilled, with a claw on the angled shoulder and two smaller claws below the periphery; protoconch of two turns, conical, smooth, rounded; mouth rounded; outer lip projecting in a broad squamose varix; canal short. Type—*Trophon stimuleus* Hedley 1907. Iredale made this a subgenus of *Gemixystus* Iredale 1929, which apparently does not occur in South Australia, the chief distinction being the protoconch which in *Gemixystus* is truncate and angulate.

A. stimuleus Hedley 1907 (*Trophon*). Minute, thin, prickly, angled at the shoulder; white; varices twelve, thin, close, laminate, oblique, produced on shoulder in a claw projecting to the suture and two lesser ones below the periphery, the shoulder folds rise in hollow thorns; varices cease on base; protoconch glossy of two whorls, conical; adult whorls three; outer lip projecting in a broad scaly varix; inner lip expanded; canal short, broad, open. Height 3.5, diam. 2.1 mm. (Type locality—80 fathoms off Narrabeen, N.S.W.).

A. segmentatus Verco 1909 (*Trophon*). Pl. 1, fig. 10. "The Bordered Apixystus." White, with a narrow brown band immediately above the suture, and from behind the mouth, round the base, to the lower part of the outer lip; sculpture elaborate—axial laminae, twelve in the penultimate, rather solid, imbricating, coronating the angle with rather long, open tubiform scales, curving up and back, and frilled with recurved valid scales distributed in spiral rows as though along spiral lirae, two in each spire-whorl and ten in the body-whorl; spirals more numerous, nine in the body-whorl; protoconch of two smooth convex whorls, with a deep suture; adult whorls five, boldly angled above the middle and constricted towards the simple suture; base gradually contracted to a moderately long snout; mouth roundly oval; outer lip thin, corrugated; inner lip a complete, prominent, erect lemella; canal as long as the mouth, slightly deviated to the left, and not recurved. Height 8.5, diam. (without the long scales) 3.5 mm. Dredged, off Cape Jaffa, Beachport, Neptune Islands, 90-300 fathoms, also Great Australian Bight (West of Eucla) 50-120 fathoms. (Type locality—90 fathoms off Cape Jaffa).

A. plicilaminatus Verco 1909 (*Trophon*). "The Spirally-folded Apixystus." Thin, long, narrow; dull white; axial lamellae, fifteen in the penultimate, erect, imbricating, projecting at the angle in long, open, tube-like upward-curving scales and below this folded in two spiral lines, two on the spire whorls, four on the body-whorl; protoconch of two smooth, convex, prominent whorls; adult whorls six, convex, swollen, angled above the middle, contracted towards the distinct simple suture; body-whorl concavely produced into a long, narrow snout; mouth oval, wider above; canal long, narrow, not recurved. Height 13.9, diam. 5.3 mm. (Type locality—150 fathoms off Beachport).

Anatrophon Iredale 1929. Narrowly spindle-shaped, angled at the shoulder; varices continuous, low, broad, solid, numerous; spirals faint; spire long; protoconch of two turns, smooth, pointed; canal short, rather straight. Type—*Trophon sarmentosus* Hedley & May 1908. Iredale considers the varicose sculpture as recalling that of *Galfridus*, whose relation he thinks

it might be. It is not much like the obsoletely variced *Galfridus eburneus* Petterd of the Flindersian region.

A. sarmentosus Hedley & May 1908 (*Trophon*). Pl. 1, fig. 11. "The Twiggy Anatrophon." Small, thin, rather glossy, angled at the shoulder; pearl grey, rust stained on the base, protoconch, and sometimes a line just below the suture; varices, ten, broad, solid, equal in breadth to their flat smooth interstices, continuous perpendicularly from whorl to whorl; on the shoulder the varices develop a pointed tubercle; spirals indistinct, cross the varices on the base; protoconch, two-whorled, smooth, pointed; adult whorls four; mouth oval; from the base of the columella projects the inner side of the short, rather straight, canal. Height 5, diam. 2.15 mm. Off Beachport, 110 fathoms. (Type locality—seven miles east of Cape Pillar, Tasmania, 100 fathoms).

A. latior Verco 1909 (*Trophon*). "The Broad Anatrophon." Solid, ovately fusiform; horn-tinted, with a white spiral line at the angle, and a broad brown band below the periphery; the most anterior spiral on the varix of the canal articulated brown, the one above it wholly white; sculpture bold; axial ribs, ten in the penultimate, high, compressed, rounded, narrower than the interspaces, extending from the suture to the varix of the canal; spirals, three on the spire-whorls, nine on the body-whorl, crossing the axials; protoconch of two-and-a-half whorls, smooth, convex, ending abruptly, apex exsert; adult whorls four-and-a-half, convex, sharply angulate above the centre; body-whorl roundly angled at the periphery, very contracted at the base; mouth oval, oblique; outer lip thin, simple; canal moderate recurved, open. Height 7.2, diam. 3.9 mm. Dredged, off Beachport, Cape Borda, Cape Jaffa, 40-150 fathoms. (Type locality—40 fathoms off Beachport).

Enatimene Iredale 1929. Regularly spindle-shaped, more or less obsoletely trellised; medium length spire; protoconch two-whorled, small; mouth free; canal long, straight, open, recurved. Type—*Trophon simplex* Hedley 1903.

E. simplex Hedley 1903 (*Trophon*). Pl. 1, fig. 12. "The Natural Enatimene." Cinnamon-brown, paler at the protoconch and canal; spirals, strong, on the early whorls two, then three, and about eight on the body-whorl; axial ribs, more or less bold, commence on the antepenultimate, sometimes fading away on the later whorls, cross the spirals, producing nodules; a strong outstanding varix behind the outer lip; mouth oval, smooth within; inner lip projecting as a narrow rim free from the body-whorl; canal long, straight, open. Height 8, diam. 3.8 mm. 35 miles S.W. of Neptune Islands, Cape Jaffa, Cape Borda, Beachport, 55-300 fathoms. Rare. (Type locality—off Port Kembla, N.S.W., 63-75 fathoms).

Emozamia Iredale 1929. Short, squat, obliquely biconical, angled at the shoulder, cancellate; axial and spiral lirae, scaly, imbricated, lamellose, with deep spiral grooves cut up rather squarely; spire rather short; protoconch few-whorled, pointed, oblique; mouth triangularly oval, large; outer lip expanded; canal short, widely open. Type—*Murex licinus* Hedley & Petterd 1906.

E. flindersi Adams & Angas 1863 (*Purpura*). Pl. 1, fig. 7. "Flinders' Emozamia." Greenish-white; widely cancellated by axial and spiral lirae, scaly, lamellose, imbricated; spire somewhat elevated, conical; protoconch about one-and-a-half whorls, indistinct, slightly oblique; adult whorls five, angulated above the centre, last whorl anteriorly contracted; mouth triangularly-oval, outer lip violet-brown within, with pale spiral lirae, margin white and crenated; inner lip nearly flat, tinted brownish-violet; operculum distinctly muricoid. Height 45, diam. 36 mm. All round the coast of South Australia, on rocks, from high to low tides. Not common. Also Albany W.A. beach, measuring 22.5 mm. (Type locality—Yorke Peninsula S.A.). A cancellate species, with the interior stained rich violet-brown, and the edge of the outer lip white.

E. levis Verco 1895 (*Trophon*). "The Smooth Emozamia." Thin; dull white; axial riblets, nine, low, broad, rather rude, irregular; spiral elevations, obsolete, broad, flat; protoconch indistinct, one-and-a-half turns slightly oblique; adult whorls about five-and-a-half; body-whorl scarcely ventricose, uniformly rounded; suture distinct, irregular, somewhat crenulated by growth lines; mouth ovate, contracted above, opening widely into the short canal; outer lip simple, thin, crenulate; inner lip, callus thin, slightly spreading; umbilicus, a chink; operculum muricoid. Height 27.5, diam. 16 mm. Backstairs Passage, 22 fathoms. There is a complete, thin, soft chalky coating which obscures the sculpture, but is evidently not an adventitious deposit. From *E. flindersi* this shell is much thinner, narrower, spire more acute, whorls less angulated, outer lip thin, not denticulated, columella not so excavated, umbilicus smaller, canal more open; surface much less sculptured. It is possibly only a deep water variety of *E. flindersi*.

Bedeva Iredale 1924. Ovately spindle-shaped, whorls angular above; axial ribs rather prominent; spiral striae, many; protoconch few-whorled, oblique; mouth ovate; outer lip thin, acute; canal long, oblique. Type—*Trophon hanleyi* Angas 1867. South Australian shells of this genus are found under stones in the mud-zone of estuaries and sheltered waters. They are destructive to young oysters. The eggs are deposited on the under-

side of shells and stones, each in a separate capsule, of about a quarter inch, crowded, rather flatter than round, with a central circular orifice. The egg can be seen both through the orifice and through the semitransparent membrane.

B. assisi Tenison-Woods 1876 (*Trophon*) (= *T. squamosissima* Tenison-Woods 1878). Pl. 1, fig. 13. Greyish-olive under a greenish covering; interior purple; axial ribs, thick, broader than the interstices, about nine in the last whorl, scaly, and with very fine axial lamellose striae; spiral lirae, conspicuous, large and small lirae alternating, and passing over the ribs; protoconch of barely two whorls, striate; adult whorls five, convex, angular above; suture impressed; canal long, recurved. Height 30, diam. 15 mm. Shallow water in estuaries and sheltered inlets; rather common, Port Adelaide River. West to Fremantle. (Type locality—North Coast, Tasmania). Some are convex and not angulated, the ribs scarcely visible, and the axial lamellae very close and high. *B. squamosissima* Tenison-Woods, is probably a juvenile *assisi*; young shells appear most intensively scaly.

B. paivae Crosse 1864 (*Trophon*) (= *Fusus recurvus* Philippi 1846: = *Trophon australis* Tenison-Woods 1875... "The Baron of Paiva's Bedeva." Solid, greenish-yellow; axial ribs strong, broad, round, crossed by numerous spiral striae; adult whorls about six, angulated above, convex; last whorl a little longer than the spire; mouth roundly oval, yellow or purple within; outer lip simple, six denticles within; columella nearly straight, slightly excavated; canal rather long, recurved; usually with a slight umbilical cleft. Height 26.5, diam. 13 mm. Under rocks and small boulders at low-water and in sheltered backwaters. Common at Snowden's Beach (Outer Harbour), Ardrossan, Port Wakefield. Also dead shells dredged Gulf St. Vincent, 9 fathoms. (Type locality—Yorke Peninsula, under stones). Very variable; they are long and slender on the Outer Harbour mud flats, shorter and more solid on the rocks situated about low-tide mark.

THAIDIDAE.

"Whelks." Strong, without varices, mostly with nodules or tubercles; siphonal canal wanting or only very short, the base usually deeply notched; columella flattened, little excavate, sometimes plicate; operculum horny, lamellate, nucleus external, lateral. Distribution—World-wide, from low-water to very moderate depths. Fossil—Tertiary.

Animal does not differ essentially from that of the *Muricidae*; foot moderate, obtuse behind; eyes usually placed near the tips of the tentacles; siphon short. Gregarious, mostly living on rocks at about low-tide mark; carnivorous, and destructive of oysters, mussels, limpets and other molluscs both bivalve and uni-valve, which it bores with the radula. The hole bored is like an inverted cone and exhibits under the microscope extremely fine scratch-like striae. The ancients obtained a dull crimson dye from *Purpura lapillus* Linne (Europe), by pressing the operculum. While many of the shells in this family are quite distinct from those of the *Muricidae*, there are some which approximate to them, but they are distinguished by the operculum, the nucleus of which is at the side (about the middle) in *Thaididae* and at, or near, the end in the *Muricidae*.

Neothais Iredale 1912. Ovate, solid; spiral ribs flatly convex, composed of fine spiral threads, more or less cut up into nodules by axial grooves; spire conic, not so high as the mouth; protoconch oblique, sinusigerous, horny, sharply conic, polygyrate, swollen at its base; body whorl very large, rounded; mouth scarcely oval, produced below into a short, open, deeply notched canal; outer lip convex, dentate-lirate within; operculum horny, with nucleus at the side. Type—*Purpura (Polytropa) smithi* Brazier 1889 (Lord Howe Island).

N. textiliosa Lamarck 1822 (*Purpura*) (not *N. succincta* Martyn 1784, from Eastern Australia). Pl. 1, fig. 14.

"Common Whelk." Large, ovate, ventricose, solid; yellowish-white, with a band of deep yellow, within the outer lip, often bordered by a narrow band of white; sometimes pinkish-yellow above the basal notch; spiral ribs about ten, rounded, faintly cut up by the obsolete axial grooves; the whole surface crowded with small round spirals, crossed by fine growth lamellae; sculpture is sometimes obsolete; protoconch small, of about two-and-a-half turns, convex, smooth; last adult whorl large, ventricose; mouth large, oval; outer lip convex, thick, grooved inside; inner lip white, not broad; operculum dark-brown. Height 80, diam. 50 mm. South Australian specimens may reach 90 x 55 mm., or 86 x 58 mm. All round the South Australian Coast, gregarious, on rocks at low water. Common. Also Western Australia. (Type locality—Australia). Really confined to the Flindersian region. The Peronian (Eastern Australian) species *N. succincta* Martyn has usually valid, unbroken, cord-like spirals (about eight in the body-whorl) not seen in the South Australian *N. textiliosa*; the latter may become somewhat rugose with broken spirals under

extreme conditions. Specimens approaching *N. succincta* Martyn have been taken at Venus Bay. (Type locality of *N. succincta* Martyn—New South Wales).

N. baileyana Tenison-Woods 1881 (*Purpura*). "Bailey's Neothais." Ovate, thick; dull pale olive; spiral ribs conspicuous, close; axial lamellae very fine, wavy; growth lines almost varicose-like, thick, irregular; spire short, conical; whorls five, the last very large, ventricose; mouth oval, white, shining; outer lip thick, crenated, broadly grooved within; inner lip broad, curved; canal a deep groove. Height 30, diam. 19 mm. Beachport, MacDonnell Bay, also Guichen Bay but apparently no further west. On rocks, rare. (Type locality—Victoria). Type in S.A. Museum. Possibly an extreme form of *N. textiliosa* Lamarck.

Lepsiella Iredale 1912. Ovate-oblong, turreted; spiral ribs strong, one only very strong medial keel on the spire-whorls, and two distant strong keels on the body-whorl (the type has often a third lower keel as strong as the others); axial ribs are strong when present, sparse (9-10) and produced into thick, more or less spinose nodules on periphery; the whole surface covered with minute lacinate frills instead of regular axial lamellae; spire moderate, conical; protoconch paucispiral, rather tall, rather loosely coiled, the whorls somewhat globose, smooth; adult whorls shouldered; suture impressed; mouth slightly oblique, oval, angled above; outer lip sharp, crenate, lirate within; canal short, open, slightly recurved; operculum, nucleus sublateral. Type—*Purpura scobina* Quoy & Gaimard 1833 (New Zealand).

L. reticulata Blainville 1832 (*Purpura*) (= *Purpura humilis* Crosse 1865). "The Netted Lepsiella." Nearly oval, somewhat angular, rather thick; pinkish, with large brown spots on the nodules; spiral ribs numerous, small; axial striae, fine, appearing only in the intervals between the spiral ribs; spire conic, somewhat elevated; protoconch of one-and-a-half turns, smooth, yellowish; spire whorls bear a zone of brown rather distant nodules, forming a keel; body-whorl, longer than the spire, angulated, with rows of similar brown nodulations; mouth oval-oblong, somewhat angular, pinkish, marked inside with a few rays; outer lip simple, subangulated medially. Height 12, diam. 6 mm. All round the coast of South Australia; beach and down to 110 fathoms, (mostly not beyond 20 fathoms). Not common. (Type locality—Gulf St. Vincent.) Also Western Australia—Esperance, Ellensbrook, Yallingup, Hopetown.

Lepsithais Finlay 1926. Strongly squamose; differs from *Lepsiella* in having two main spiral cords on the spire-whorls (with a third weak one, present or absent, above them) and eight regular thick spirals on the body-whorl, smooth except for the

axial lamellation; axial ribs, if present, are numerous (12-16), weakly developed, and not spinose. Protoconch similar to that of *Lepsiella*. Type—*Polytropa squamata* Hutton 1878 (New Zealand).

L. vinosa Lamarck 1822 (*Buccinum*) (= *Ricinula adelaidensis* Crosse & Fischer 1865: = *Purpura littorinoides* Tenison-Woods 1875: = *P. propinqua* Tenison Woods 1876: = *Cominella albolirata* Tenison-Woods 1878. Pl. 1, fig. 15. *vinosa* = full of wine). Oval, thick, scaly, spire elevated; whitish, usually covered by a green coating; axial ribs, rugose, lamellose, crossed, so as to form a sort of rough coarse network, by about eight rather projecting spiral ribs; adult whorls five, slightly convex, and the absence of spiral ribs just below the suture, makes them appear keeled; body-whorl rather longer than the spire; mouth narrowly oval, deep wine-colour; outer lip stoutly thickened, about five whitish tubercles inside at some distance from the edge; inner lip tinged whitish inside; operculum reddish-brown, nucleus sublateral. Height 26, diam. 14 mm. All round the coast of South Australia, on rocks at low-water. Rather common. Also Western Australia, Albany; does not appear to occur beyond C. Leeuwin. (Type locality—the seas of New Holland [Peron]). Very variable and has an extensive synonymy. Exceptional specimens have the axials coalesced, with as few as four very wide and high with second axials on them; others with very narrow axials up to fourteen, while in others they are nearly obsolete; so the spiral cords in some are very valid and nearly equal, in others they are obsolete or unequal.

L. aurea Crosse & Fischer 1865 is a colour variety and differs in its pale yellow mouth, which takes on the inside an orange tinge. It was also described as a little smaller than *L. vinosa*, but we have taken both of the largest size from the same rock at the Outer Harbour. Fairly common, on exposed rocks. (Type locality—Port Adelaide and Gulf St. Vincent).

L. adelaidae Adams & Angas 1863 (*Adamsia*). "The Adelaide Lepsithais." Reddish-brown; axially densely lamellose; spiral lirae, valid, nodulous, (six in last whorl); spire elate, longer than the mouth; whorls seven, convex; mouth ovate, subrostrate anteriorly; outer lip curved, margin rather thickened, scarcely reflexed; inner lip simple. (Type—Height 16, diam. 6.5 mm.; locality—Port Adelaide). Probably a narrow attenuate rather smooth form of *L. vinosa* Lamarck.

Tolema Iredale 1929. Biconical, spire tabulate; axial ribs numerous, obscure, marked by lines of erect scales; shoulder angle, a line of sub-tabular imbricating scales forming an erect

hood; numerous spiral lines of smaller scales; protoconch sinusigerous, of five turns, with four keels on last whorl, two of which ascend the spire, the first two whorls smooth, the others crossed obliquely by lamellae which cross the keels; outer lip thickened, reflected; canal produced, sinuate. Type: *Purpura sertata* Hedley 1902.

T. sertata Hedley 1902 (*Purpura*) (not *Coralliophila lischkeana* Dunker 1882 [*Rapana*] from Japan). Biconical; faint pinkish, scales white; axial ribs, seven, obscure, marked by erect scales (when beach-rolled only distant axial ribs appear); shoulders of whorls subtabular with imbricating scales, beneath are six spiral lines of much smaller scales connected by lamellae with the scales above and below; two similar spirals between suture and shoulder; protoconch sinusigerous, of five turns, with four keels on last whorl, two of which ascend the spire, the first two whorls smooth, the others crossed obliquely by numerous delicate lamellae which cross the keels; (when rolled the keels are rubbed off the protoconch leaving the whorls smooth, round) adult whorls three; mouth triangularly oval; outer lip thickened, reflected. Height 9 diam. 4.5 mm. Dredged, Beachport to Bunbury 22-300 fathoms. (Type locality: Port Kembla, N.S.W. 63-75 fathoms.)

Rapana Schumacher 1817. *Rapa* = a turnip. Ventricose, axis perforated to the apex; spire not much elevated; mouth oval narrowed below; canal open, slightly recurved; inner lip reflected, free anteriorly; umbilicus wide, corrugated; operculum horny, lamellar, nucleus external, sublateral. Type: *R. bezoar* Linne (Japan).

R. mira sp. nov. pl. 1. fig. 16. "The Admirable *Rapana*." Previously mistaken for *Coralliophila elaborata* H. & A. Adams 1863 from the Sandwich Islands. We describe it as a new species. Biconic; white, deep mauve within the mouth and on the columella; axial ribs, regular, broad, rounded, twelve on body whorl, fading on the early whorls; spiral riblets narrow, close, encircling the whole shell and passing over the axial ribs and interstices; spire conical, about two-fifths of total length; protoconch eroded, apparently smooth; adult whorls five, flat-sided, last roundly shouldered; mouth rather wide, ovate-oblong; outer lip obscurely, finely, denticulate by the spirals; umbilicus narrow for the genus; operculum ear-shaped, horny, lamellar, nucleus external, sublateral. Height 26 diam. 16 mm. St. Francis Island in rock pools between tide-marks. (Reg. No. D 10601 S. Aus. Mus.) St. Francis Island, S.A. to Ellensbrook, W.A. In place of mauve some specimens are white within the mouth and on the columella.

R. nodosa A Adams 1853 (Latiaxis) (= *Coralliophila wilsoni* Pritchard & Gatliff 1897: not *C. rubrococcinea* Melville & Standen 1901, from the Persian Gulf.) "The Nodulous Rapana." Biconic, short; white; spiral lirae over entire surface, fine crowded; whorls five, roundly angulated, bearing about ten large, rounded nodules on the shoulder; mouth pyramidal; canal short, tortuous; umbilicus wide, its margin serrated; aperture buff, sometimes purple. Height 20 diam. 11.5 mm. All along the South Australian and Western Australian coasts to Rottnest Island, beach, and down to 130 fathoms; uncommon. (Type locality—Philippines, probably incorrect; Port Jackson [Hedley])

ELLOBIIDAE.

Spiral, ovate, solid, periostracum horny; spire usually short; last whorl large; base rounded; mouth elongate; outer lip sometimes dentate; inner lip with strong tooth-like folds; inner walls of the whorls usually absorbed, forming a single cavity. Distribution—Australasia, Pacific, South America. Fossil—Jurassic. Animal—head ending in a snout; tentacles sub-cylindrical, contractile; eyes sessile at the inner sides of their bases; mantle closed, with a thickened margin; respiratory orifice posterior, on the right side; foot ovate, obtuse behind; mouth with an upper horny jaw, and with two buccal lobes, united above, separate below. Sexes united in the same individual. Usually frequent salt marshes, but sometimes terrestrial.

Marinula King 1831. Ovate-oblong, imperforate, solid, smooth; spire short, conic; mouth scarcely oval; outer lip sinuous above, simple arcuate; columella flattened, with two or three folds, the upper one very large, obliquely descending, the lower two smaller and less oblique. Type—*Marinula pepita* King 1831.

M. meridionalis Brazier 1877 (*Auricula, Alexia*) (= *A. harrissoni* Beddome 1882). "The Meridional Marinula," apparently so called from the variceal rib down the centre of the back of the body whorl. Oblong-ovate, thin, transparent, imperforate; light-horn colour, peristome and columella white; axially striate, otherwise smooth; usually a varix, the remains of an old mouth, in the centre of the back of the body whorl; spire acuminate; protoconch papillate; whorls seven, slightly convex; suture impressed; base rounded; mouth vertical, narrowly ovate, as long as the spire; outer lip slightly reflected; inner lip with three folds. Height 8 diam. 4 mm. Port Adelaide River, under shrubby-samphire, just above high-water mark; not uncommon. (Type locality—Port Adelaide River, in swamps.)

M. xanthostoma Adams 1854 (not *M. patula* Lowe) 1831 [*Melampus*]). Pl. 3, fig. 1. Ovate-oblong, solid, shining, reddish-yellow, mouth yellow; rather smooth; spire acute, as high as the mouth; whorls five, somewhat convex, last large, rounded; mouth oblong-ovate, angled above, rounded below; outer lip acute somewhat thickened medially, sinuate above; columella with three tooth-like folds, the highest the largest. Height 10 diam 6 mm. All round the coast from Macdonnell Bay, S.A. to Fremantle, W.A. Beach, not common. (Type locality—Moreton Bay, Queensland.)

M. parva Swainson 1856 (*Grennobates*). "The Small Marinula." Ovate, thin, light; whitish or light brown, mouth brown; growth lines well marked; spire conic, about as high as the mouth; protoconch minute, pointed; adult whorls four; last very large, convex; mouth vertical, ovate, angled above, rounded below; columella with two strong folds, the upper one larger, high up. Height 7.5 diam. 5 mm. American River, Kangaroo Island. Beach, rare. (Type locality—Oyster Cove, Hobart.)

Opficardelus Beck 1837. Ovate-oblong; spire elevated, subconic; mouth oval; outer lip simple, without teeth; columella with two folds, the lower oblique, the upper horizontal and prolonged exteriorly, forming a periumbilical keel. Type—*Auricula ornata* Ferussac 1821 = *A. australis* Quoy & Gaimard 1833.)

O. ornatus Ferussac 1821 (*Auricula*) (= *Auricula australia* Quoy & Gaimard 1833: = *Grennobates cornea* Swainson 1856) Pl. 3 fig. 2. "The Ornate Orphicardelus." Ovate-conic, rather solid, sometimes with an umbilical chink; yellowish or light-brown, with one or several dark-brown spiral bands; growth lines distinct, also some times axial ribs, flattish, numerous, irregular; a narrow groove below the suture; periostracum horny, thin, shining; spire conical, about as high as the mouth; protoconch very small, usually eroded; adult whorls nine, slightly convex, the last large, ventricose, convex; mouth subvertical, narrowly ovate, angled above; outer lip sometimes with an outer varix, smooth inside; columella folds two, the upper horizontal at junction with parietal wall, the second oblique, lower; inner lip a thin shining glaze; sometimes an indistinct umbilical chink present. Height 13.5 diam. 7 mm. (Type.) Recorded from South Australia by Adcock, but we have not seen specimens. Also Victoria and Tasmania. In brackish water and mangrove swamps. (Type locality—New South Wales.)

PLATE 1.

- Fig. 1—*Pteronotus angasi* Crosse.
Fig. 2—*Pteronotus triformis* Reeve.
Fig. 3—*Murexsul umbilicatus* Tenison-Woods.
Fig. 4—*Galfridus eburneus* Petterd.
Fig. 5—*Cyphonochelus syringianus* Hedley.
Fig. 6—*Typhis yatesi* Crosse.
Fig. 7—*Emozamia flindersi* Adams & Angas.
Fig. 8—*Litozamia rudolphi* Brazier.
Fig. 9—*Benthoxystus columnarius* Hedley & May.
Fig. 10—*Apixystus segmentatus*. Verco.
Fig. 11—*Anatrophon sarmentosus* Hedley & May.
Fig. 12—*Enatimene simplex* Hedley.
Fig. 13—*Bedeua assisi* Tenison-Woods..
Fig. 14—*Neothais textiliosa* Lamarck.
Fig. 15—*Lepsithais vinosa* Lamarck.
Fig. 16—*Tolema mira* sp. nov.

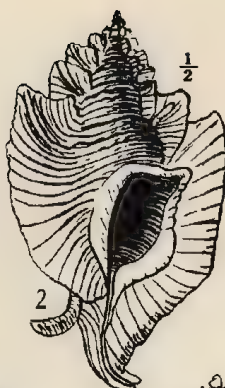
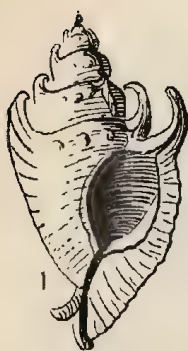
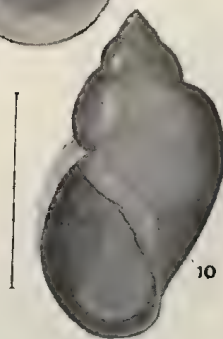
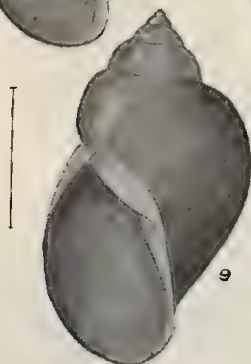
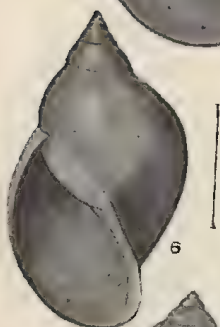
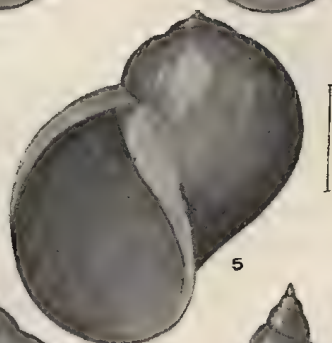
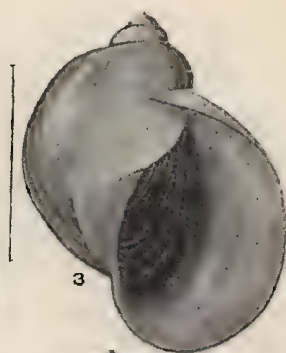
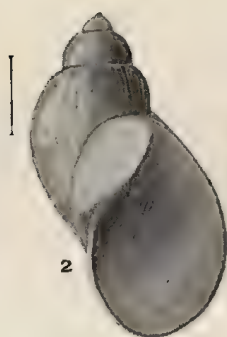
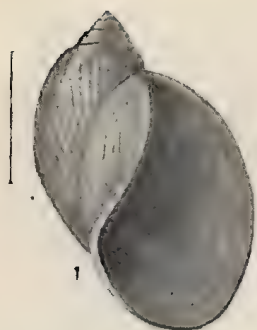


PLATE 2.

- Fig. 1—*Myxas papyracea* Tate.
Fig. 2—*Limnaea subaquatilis*. Tate.
Fig. 3—*Limnaea lessoni* Deshayes.
Fig. 4—*Isodorella newcombi* Adams & Angas
Fig. 5—*Isodorella inflata* Adams and Angas.
Fig. 6—*Ameria tenuistriata* Sowerby.
Fig. 7—*Isodorella rubida* Tate.
Fig. 8—*Ameria pyramidatus* Sowerby.
Fig. 9—*Ameria bullata* Sowerby.
Fig. 10—*Ameria pectorosa* Conrad.
Fig. 11—*Ameria aliciae* Reeve.



B.C.C.



PLATE 3.

- Fig. 1—*Marinula xanthostoma* Adams.
Fig. 2—*Orphicardelus ornatus* Ferussac.
Fig. 3—*Leuconopsis pellucidus* Cooper.
Fig. 4—*Plecotrema ciliata* Tate.
Fig. 5—*Pugillaria stowae* Verco.
Fig. 6—*Siphonaria diemenensis* Quoy & Gaimard.
Fig. 7—*Salinator fragilis* Lamarck.
Fig. 8—*Gadinia conica* Angas.
Fig. 9—*Planorbis isingi* sp. nov. (lateral view).
Fig. 10—*Planorbis isingi* sp. nov. (dorsal view).
Fig. 11—*Ancylus australicus* Tate.
Fig. 12—*Gundlachia petterdi* Johnston.
Fig. 13—*Segmentina victoriae* Smith.
Fig. 14—*Pupilla australis* Angas.
Fig. 15—*Pupoides adelaidae* Adams & Angas.
Fig. 16—*Succinea australis* Ferussac.
Fig. 17—*Notobadistes fodinalis* Tate.
Fig. 18—*Glyptorhagada silveri* Angas.
Fig. 19—*Notobadistes bitaeniatus* Cox.
Fig. 20—*Rhytida gawleri* Brazier.

Leuconopsis Hutton 1884. Ovate, ablong, imperforate acute, smooth inside; inner lip with one fold, strong, medial, smooth; spire conical; mouth elongate, ovate, outer lip simple, prominent, and a small low tubercle below. Type—*Leuconopsis obsoleta* Hutton 1878. (New Zealand; minute, very variable in size and shape.)

L. pellucidus Cooper 1841 (*Auricula*) (= *Tornatella minuta* Petterd 1879 = *L. victoriae* Gatliff 1905: = *L. tatei* Gatliff 1905) Pl. 3 fig. 3. "The Pellucid *Leuconopsis*." Minute, ovate, imperforate; opaque white; spiral grooves, faint, sometimes only on upper whorls; periostracum thin, dirty brown, showing oblique growth lines which are barely visible in the white dead shell; spire about as high as the mouth; spire whorls slightly convex, last large, convex; inner lip with a central well developed tooth-like fold, with a low tubercle below, only visible when viewed sideways. Height 2 diam. 1.4 mm. Shell sand, Fowler Bay, Moonta Bay, Brothers Island, Coffin Bay. Not common. (Type locality—Picked out of sand from Van Dieman's Land.) The position of the excentric protoconch to the right or left of the mid-line is manifestly a question of how many half whorls are formed before maturity is reached.

Plecotrema H. & A. Adams 1853. Oval-conic or sub-fusiform, solid, usually spirally grooved; spire conical, sharp; mouth oblong, contracted; inner lip with three folds, one of which is bifid; peristome thickened, usually varicose, bidentate or tridentate within. Type—*P. typica* Adams.

P. ciliata Tate 1878 Pl. 3 fig 4. "The Ciliated *Plecotrema*." Fusiformly-ovate, imperforate, solid; shining brown and black, with a narrow light coloured band near the suture and a reddish coloured one in between; many axial incised lines and regular spiral wrinkles; at the intersection of the lines, punctuatedly impressed and ciliated, the cilia yellowish-brown, thread-like; spire conic, rather pointed; whorls seven, scarcely convex with one shallow groove near the suture, the last whorls forming three-fourths of the total length; outer lip with two tubercular teeth; columella with a white tubercular tooth above and below with two compressed spiral folds; inner lip expanded and reflected to form a false umbilicus. Height 7.5 diam. 4 mm. Port Adelaide, Streaky Bay, Denial Bay, Murat Bay, Port Wakefield, Gulf St. Vincent. Not common. (Type locality—Mangrove swamps, under shrubby-samphire, just above high-water mark, Port Adelaide, in company with *Marinula meridionalis* but not so abundant as that species.)

AMPHIBOLIDAE.

Globose, umbilicated; spire short, whorls shouldered above; mouth scarcely oval; operculum horny, subspiral.

Distribution — Australasia, Polynesia, Indian Ocean. Fossil—Pliocene. Animal having a large flattened disc-shaped head, lightly sinuated in front; eyes sessile, at the bases of the two small flattened triangular tentacles; pulmonary opening on the right side; visceral mass spirally coiled. Sexes united in the one individual. Lives between tide-marks in salt or brackish water on mud-flats in sheltered bays. Very sluggish habits, feeds on vegetable matter contained in mud, disposing of large quantities in this manner. A New Zealand representative of this family (*Amphibola crenata* Martyn) although air-breathing, will live for a week or ten days in fresh water, and for more than a fortnight in salt water, without being exposed to the air.

Salinator Hedley 1900 (= *Ampullarina* of authors, not of Sowerby). Subglobose, thin, umbilicated; spire short; protoconch paucispiral, obtuse, rounded, smooth, polished; adult whorls rounded; outer lip with posterior sinus; inner lip simple; operculum horny, ovate, subspiral. Estuarine. Type—*Ampullaria fragilis* Lamarck 1822.

S. fragilis Lamarck 1822 (*Ampullaria*) Pl. 3 fig. 7. "The Fragile Salinator." Somewhat globose, semitransparent, umbilicated, solid; greyish-horn with many axial undulating light-brown flames and frequently from one to three spiral brown bands; axial lamellae imbricating, less distinct on the spire whorls; protoconch, about two turns, rounded, globose, smooth, polished; adult whorls four, ventricose, with a rounded keel at the angle of the shoulder, and another less distinct below it; suture deep; mouth almost round; outer lip strongly convex, sharp, thickened towards the base, with a shallow rounded sinus at the angle of the shoulder; inner lip somewhat expanded; umbilicus rounded, deep; operculum horny, ovate, subspiral. Height 20 diam. 21 mm. Estuarine, between tide-marks, on mud flats and in sheltered bays. Very common at Outer Harbour. Also King George Sound, Bunbury, W.A. Very variable in colour. (Type locality—King George Sound.)

S. quoyana Potiez & Michaud 1838 (*Amphibola*). "Quoy's Salinator." Resembles *S. fragilis* Lamarck, save that the spire itself is half, instead of one-third, the total height; colour also usually deeper, the zig-zag lines more pronounced and the sculpture coarser. Height 18 diam. 16 mm. Common in company with *S. fragilis*, of which it may be an exsert variety. Also Albany, Bunbury, W.A. (Type locality—"Nouvelle Zelandie" [error] Probably Kangaroo Is.)

SIPHONARIIDAE.

Conical, limpet like, muscle-impression interrupted by a lateral groove on the right side corresponding with the pulmonary orifice. Distribution—Warm and temperate seas, the majority of the species in the Southern Hemisphere; on rocks between tide-marks, like limpets. Fossil—Eocene of Paris. Animal having the head expanded, the tentacles atrophied, bilobed in front; eyes sessile on the outer sides of the disc; visceral mass conical; respiratory orifice covered by a large fleshy lobe of the mantle; aquatic, pallial cavity containing secondary branchial laminae; jaw arcuate, with simple or projecting margin and with vertical filaments above; no operculum. Sexes united in the same individual. Eggs in white gelatinous rope-like masses, attached to rocks in irregular curves, much like those of Nudibranchs.

Siphonaria Sowerby 1824. Limpet-like, inside polished summit central or nearly so; muscle-impression horseshoe-shaped, front ends united by a groove corresponding to the line of attachment of the mantle to the shell; it is interrupted on the right side by a deep siphonal groove, which produces a slight projection on the margin; external surface radially ribbed. First species—*Siphonaria sipho* Sowerby (India).

S. diemenensis Quoy and Gaimard 1833. Pl. 3, fig. 6. "The Van Diemen's Land Siphonaria." Oval, convex, somewhat high; apex central, acute; radiating ribs, about forty, small, conspicuous, rounded; ashy-gray, slightly rugose; interstices dark-brown, concave, occasionally with smaller ribs which reach half-way up the shell; margin acute and finely undulating; interior regularly marked with dark-brown and white lines, the brown marks becoming broader towards the edge and often bifurcating; spatula badly defined and clouded reddish-brown; siphon not always defined. Length 25, breadth 23 mm. All along the coastline of South Australia. On rocks between tide-marks, common. An acutely convex species irregularly closely ribbed, with the interstices excavately grooved and further distinguished by the inner margin being conspicuously tessellated. The South Australian shell is very variable. It may be high and steeply conical, or so depressed as to be nearly flat. The ribs may be as few as seventeen or very numerous, distant or crowded; high, narrow, and sharp cut, or low, broad and rude; straight, smooth, and regular, or crooked, rough, irregularly noded, or scabrous. Rarely, the shells are colourless when taken alive; or yellowish, with faint smokiness between the ribs. May be brown throughout, or with bluish-white ribs and bluish-black between. (Type locality—D'Entrecasteaux Channel, Tasmania.) The following

remarks are from Tenison-Woods' observations: Animal citron-yellow beneath, dusky, speckled with yellow, above; head separated from the foot by a deep transverse fissure; base of head a pale neutral tint; mouth when closed appears as a reddish-brown spot; lower lip yellowish, when closed is like a longitudinal fissure, as it opens it becomes crescentic, the upper lip is then seen, arched, fine reddish-brown above, with yellow cirrhi below; the radula is protruded from this, and moves up and down with an ordinary licking movement; the appearance of the radula is that of the finger of a glove with the end pushed in upon itself, and the crowded edges of the tube thus formed brought together by the drawing in of the top until they unite in a rounded point, which is then drawn up; the pushing out and drawing in of the top of the "finger" from within is the manner in which it feeds, thus the free end of the tube is apparently brought backwards and forwards, and the food triturated and carried into the œsophagus. No eyes are visible. Above the foot on the right side of the animal is a lobe which forms a kind of semi-circular tube, closely pressed to the shell, and here the mantle is not visible; this tube is the siphon, and is lobed so as to be capable of a kind of bipartition which probably divides the orifice into an excretory as well as respiratory duct; this lobe of the foot acts as a kind of operculum, closing the orifice when necessary; if placed in the open air the siphon tube opens at once and the tube is always open when the animal is taken from the rocks it inhabits, and which are not long covered by the tide; a process of the mantle forming a kind of operculum to the siphon is often protruded a considerable distance from the shell. A little in front of the siphon is the female organ, and on the right side of the head the male, where the tentacle would be if there were one. The animal is attached by a horseshoe muscle running round the posterior half of the shell above the mantle and foot; the siphon is seen as the tube running in a sinuous form through the pulmonary sac; by its side runs the intestine, which continues round the posterior part of the foot, and then disappears under the liver, and the ovary, which is often the largest organ, and of a bright salmon colour; the intestine makes many convolutions in the liver; the buccal mass is red and fleshy, in which two long, thin, rather broad cartilaginous jaws are imbedded; amid these the broad radula is spread, working almost perpendicularly, with a very slight movement backwards; the œsophagus is bright orange-yellow, and terminates at the distance of about 20 mm. in a sac of the same colour; the radula curls around and projects as a closed glassy tube outside the buccal mass. The radula is about eight millimetres long (when unrolled) by three broad, and is a series of curved lines of teeth diminishing in

size from the centre to the margin; the teeth have a broad crescentic edge, which increases in width downwards and is fixed upon the membrane; the teeth gradually diminish outwardly from a central rudimentary tooth to a mere faint line of curved tubercles.

S. baconi Reeve 1856. (Not *S. luzonica* Reeve, from Philippine Islands. "Bacon's Siphonaria." Roundly elliptical, very flat, thin, usually much eroded; dull white, rarely yellow; sometimes with tiny blackish-brown spots, few or many, scattered irregularly or in patterns; interior white, the horseshoe amber coloured; radiating ribs, seventeen to forty-four. Distinguished by the particularly neat and delicate pattern of rayed sculpture. Length 30, breadth 23, height 5.5 mm. All round the coast of South Australia; common in the South-East but not elsewhere. On rocks exposed at low tide and beyond, on open ocean shores and in quiet bays. The animal is of a light saffron-yellow colour. (Type locality—Swan River, W.A.) Adcock's Handlist No. 455 gives *S. luzonica* Reeve (in error) which bears nine to thirteen ribs, stouter than ours and comes from the Philippine Islands.

S. tasmanica Tenison-Woods 1876. (Not *S. zonata* Tenison-Woods 1878.) "The Tasmanian Siphonaria." Irregularly oval, distinctly subrostrate on the siphonal side, tumidly conical, high; bluish-white concentrically and variously zoned with olive lines or bands; interior rich purple-brown, highly enamelled; spatula brownish-white extending partly down the siphonal sinus; radiating ribs forty to fifty, fine, flattened, more or less interrupted by the siphonal canal; protoconch median, brown, hooked backwards and spirally curved, its nucleus deep amber and deviated to the left, on which side alone the two distinct, slightly elate, smooth, round whorls of the protoconch are visible; shell margin dentate, rarely dotted with white. Animal, dull brown, with numerous small light spots of varying size; foot yellowish, shading to orange near the head; mantle brown, fringed at the edge with whitish and black spots; when the mantle is irritated the black spots appear to be the points where it is drawn in; head, a large and many-lobed mass, forming a cup-like expansion round the very small mouth; no eyes visible. Length 22, breadth 19, height 9 mm. McDonnell Bay also Beachport, on rocks above low water, rather common. Chiefly distinguished by the livid brown colour of the interior, and short white tessellated spots on the inner margin; depressedly convex, ribs alternately larger. (Type locality—Tasmania.)

Gadinia Grey 1824. Patelliform, obliquely conic; protoconch obtuse, subcentral; aperture orbicular, with a small groove directed from the centre to the anterior side of the right margin,

tangential to the end of the muscle-scar, which is horseshoe-shaped and broadly open in front; a small muscular scar in front of the left end of the adductor-scar. Type—*Gadinia afra* Gmelin (Africa).

G. conica Angas 1867 (= *G. angasi* Dall 1871). Pl 3 fig. 8. "The Conical *Gadinia*." Very variable. Convexly conical; white, outside and in; radiating ribs, about thirty-eight, strong, irregular, concentrically ridged; protoconch subcentral. Length 16 breadth 14 height 7 m.m. Ocean beaches, from Beachport to the Head of the Great Australian Bight; not common, but typical. (Type locality—Coogee Bay, N.S.W.)

G. albida Angas 1878 (*Siphonaria*). "The White *Gadinia*." Elongately ovate, subsymmetrical, sharply conical, rather thin; white; radiating ribs very numerous, rounded, unequal, crossed more or less with squamose ridges; protoconch subcentral, prominent, smooth, recurved; siphonal groove inconspicuous; interior white, shining, almost pearly. Length 16 breadth 12 height 7 mm. Uncommon. (Type locality—Gulf St. Vincent.)

Pugillaria Iredale 1924. Patelliform, subconvex, depressed; radiating ribs numerous; protoconch posterior, oblique, inclining backwards, pointed and slightly projecting posteriorly; right margin faintly bulged above the siphonal groove, just in front of the middle point. Type—*Siphonaria stowae* Verco 1906.

P. stowae Verco 1906 (*Siphonaria*). Pl. 3, fig 5. "Stow's *Pugillaria*." Small, rather solid, oval, depressed; ribs opaque white; dark brown specks, lines and blotches, chiefly intercostal, plainer on the right side; interior light-horn, a chestnut horseshoe around the posterior third, and broken blotches on each side of the siphon; radiating ribs numerous, subdistant, rather rude, as wide as the interspaces, multiplying by frequent intercalations; growth lines rough, irregular; protoconch subterminal one-eighth distant from anterior end, slightly to left of the mid-line, oblique, inclining forwards, pointed, slightly projecting anteriorly; dorsum somewhat convex; left margin straightly convex; right more rounded, bulge at the site of the siphon; interior smooth, margin invalidly crenulate. Length 10 breadth 7 height 4.5 mm. Pondolowie Bay, Encounter Bay, Scales Bay, Tourville Bay. Uncommon. (Type locality—Pondolowie Bay, in Spencer Gulf, on rocks above tide-mark.)

LIMNAEIDAE.

"Pond-snails." Thin, horn-coloured, mostly spiral, usually dextral, sometimes limpet-like, capable of containing the entire animal contracted; mouth simple, rounded; lip sharp; no operculum. Distribution—from Greenland to Straits of Magellan, in fresh water (sometimes brackish), of all altitudes and latitudes. Fossil—Lias. Animal with a short, broad muzzle, dilated at the end; mouth wide with a horny upper jaw; tentacles flattened or filiform, with the eyes sessile, at their inner bases; mantle-margin variously modified; respiratory orifice at the right side; foot flattened, lanceolate, or ovate; excretory orifices on the left side of the neck; no inferior pallial lobe. The fresh-water, air breathing molluscs of which this family is composed live in lakes, ponds, pools, ditches, and, though not so abundantly, in rivers; occasionally found in brackish waters; they crawl on the mud and stones at the bottom, or on water-plants, and in warm sunny weather ascend to the surface, and creep, as it were, reversed on the surface of the water, or letting themselves down occasionally by means of a glistening thread. Some feed on Confervae and other aquatic plants, while to others nothing seems to come amiss, even drowned cats, and some are cannibalistic when overcrowded. When the ponds are dried up the Limnaeids bury themselves in the mud to a depth of several inches whilst it is still soft. Ice on the pond does not stop their activity below, and they may even be frozen in solid ice, apparently without prejudice to their vitality. They are prolific, and it is estimated that with some species, an individual produces about 1,300 eggs in one season. These are deposited in cylindrical masses of clear jelly. Full-sized specimens of shells need be sought only in large ponds; it appears that the rate of development and ultimate size attained are in direct proportion to the volume of water in which the individuals have lived. A number taken from a water-meter were adult but very small. Pond-snails have been recorded from unlikely situations—in a pool, about 20 feet in diameter, cut off from streams and fed by a spring; in the isolated waters of pits, quarries, and brick-yards; in ponds which had been dry for three years at a stretch, they reappeared in the fourth year as abundant as ever when rains replenished the ponds; in a puddle, containing two or three gallons, formed by the breaking out of a small spring by the roadside; commonly found in horse-troughs, and sometimes in troughs which are nowhere near a pond or other water; a living specimen was found on the top of a church in Preston (England), probably carried there adhering to one of the sticks taken by a jackdaw

building in the tower; in an artificial pond, six feet across and a few inches deep, in California, in a district where for miles there was no natural surface water; in a dew-pond on the South Downs (Sussex) 300 feet above the marshes, with the nearest water distant half-a-mile. Some pond-snails are not altogether incapable of migration on land. Animals of various kinds, it can hardly be doubted, are actively engaged in dispersing shells. Birds have been shot on the wing with shells and ova attached, and ducks have been seen to rise from a pond with duckweed adhering to their backs, so it seems probable that young and small shells may sometimes be transported along with the water-plants.

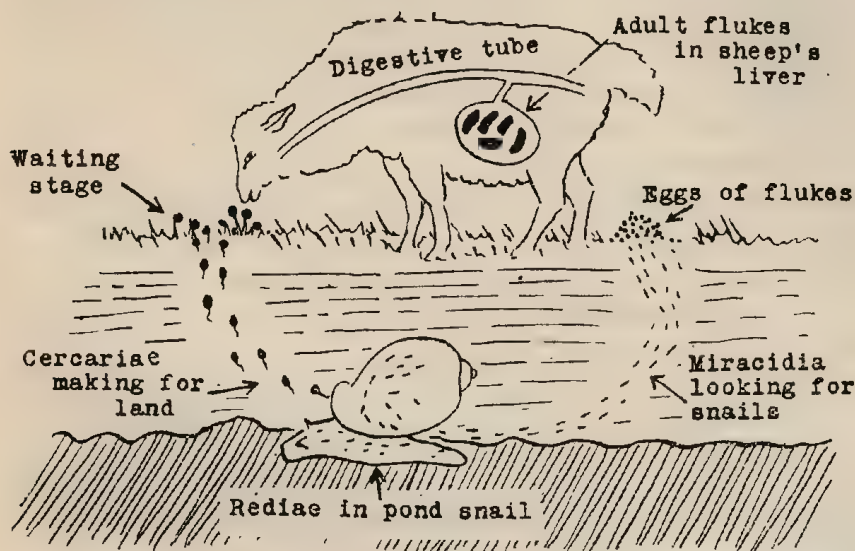


Fig. 1—The Life-cycle of the Liver-fluke. (After "Science of Life".)

Some members of this universal family are the intermediate hosts of the Liver-fluke (*Fasciola hepatica*) the cause of Rot, that scourge of the sheep-farmer. The parasite spends part of its life cycle in the body of the pond-snail. See text fig. 1. Both sexes are united in the same individual Liver-fluke which is very prolific, though incapable of self-fertilisation. It lives in the sheep's liver. The eggs leaving the liver of an infected sheep, pass out with the excrement, and are deposited on the pasture. They hatch out

into tiny, conical creatures of simple structure, without mouth or stomach, and these swim about in puddles and drinking pools. It is here that the *Miracidium* as it is called, comes in contact with a certain species of pond-snail and bores into it. If a snail is not found within eight hours, the *Miracidium* perishes. Within the body of the snail the *Miracidium* alters, becoming like an elongated hollow bag. After a fortnight's nourishment by the blood of the snail, the parasite produces a number of young and dies. The *Rediae*, as the young are called, are worm-like creatures, feeding on the snail's body, showing preference for the liver. Several generations of *Rediae* live and die within the snail, until finally a new form appears, the *Cercariae*, smaller than the *Rediae*, with big round heads and long thin tails. The *Cercariae* leave the snail in search of bigger prey. They swim up wet blades of grass, protecting themselves with a coat of slime which hardens, and enter the sheep by the mouth when the life cycle begins afresh. It is to be noted that for one parasite there is but one snail species, another will not do even if closely related. This is again referred to under *Isodorella newcombi* of this family.

Limnaea Lamarck 1799. "Pond-snail." Spiral, thin, horny, dextral; spire pointed; protoconch few-whorled, small, obtuse; mouth oval, large, rounded below, margins united by a thin callosity; peristome thin, sharp; columella with an oblique fold entering above. Type—*Helix stagnalis* Linne, (Europe).

L. subaquatilis Tate 1880. Pl. 2, fig. 2. "The Sub-aquatic Limnaea." Dextral, ovate, thin, shining; pale horn-coloured; smooth; axially very weakly plicate; spire one-sixth of total length, pointed; whorls four, subventricose; suture impressed; mouth large, ovate, half the length of the shell; outer lip moderately expanded; columellar fold thin; opaque white, and reflected. Height 10, diam. 5.5 mm. River Torrens (Adelaide), Torrens Reedbeds (near Henley Beach), a pond at Victor Harbor, Millicent. (Type locality—Among paludinal herbage growing on the marshy margins of the River Torrens at Adelaide).

L. lessoni Deshayes 1880. Pl. 2, fig. 3. "Lesson's Limnaea." Dextral, globose, thin; pale horn-coloured; smooth; spire one-eleventh of the total length of shell; outer lip moderately expanded; columellar fold slender. Height 25, diam. 20 mm. Morgan (River Murray), Binnun, Port Darwin, Palm Creek, Clarence River. (Type locality—New Holland).

Myxas (Leach) J. Sowerby 1822 (= *Amphipeplea* Nilsson 1823). Globular, ventricose, mostly dextral, thin, horny, translucent; spire very short, sharp, depressed; last whorl ventricose; mouth very large, rounded below; columella without any fold; outer lip sharp. Type—*Helix glutinosa* Montfort. (Ireland). Animal with the mantle-margins developed, partly covering the shell; tentacles flat, triangular.

M. papyracea Tate 1880 (*Limnaea*). Pl. 2, fig. 1. "The Paper-shell Myxas." Dextral, oblong-ovate, thin, shining; pale horn-coloured; smooth, spirally faintly wrinkled; spire about one-tenth as long as the rest of the shell; whorls half-rounded at the sutures, last whorl sub-expanded below; outer lip sinuously produced about the middle; columella without distinct fold; inner lip widely and thinly spread. Height 17, diam. 10.5 mm. Penola, Torrens Reedbeds (Near Henley Beach), Discovery Flat (Kangaroo Island). (Type locality—The bed of a dried-up marsh near Penola, S.A.). The mantle lobes entirely cover the shell; the foot is so voluminous that it cannot be wholly withdrawn into the wide-mouthed shell; the egg-masses are circular in outline, about one-fourth of an inch in diameter, depressed, the exterior somewhat coriaceous; the egg-capsules number about forty.

Isodorella Tate 1896. "Reversed pond-snail." Spiral, sinistral, globose; last whorl much inflated, peritreme continuous, adnate to the parietal wall, and forming a false umbilicus; columella without a fold. Type—*Physa newcombi* Adams & Angas 1863. Animal having the tentacles slender (filiform-cylindrical), suddenly dilated at the base of the upper outer side, the eyes on the inner base of the tentacles; mantle not exert, with a plain margin.

I. newcombi Adams & Angas 1863 (*Physa*) (= *Physa subinflata* Sowerby 1873) Pl. 3, fig. 4. "Newcomb's Isodorella." Sinistral, ovate-globose, thin; brownish; periostracum horny, raised into spiral fringes of hairs and imbricating folds at the suture; spiral striations, very fine; spire acute, one-fourteenth length of whole shell; outer lip expanded; no columellar fold. Height 13.5 diam. 11.5 mm. Mt. Margaret (Central Australia), Alice Springs, Eyre's Peninsula, River Para, River Angas at Strathalbyn, Penola, Kangaroo Island, Naracoorte. (Type locality—Mt. Margaret, Central Australia). *I. brazieri* Smith 1883 (*Physa*) from New South Wales, appears to differ from *I. newcombi* only in that the spire of *brazieri* is a little less prominent and the body-whorl a little less inflated. Tate (Feb.

1896) considered *brazieri* as a mere individual variation of *newcombi*. *I. brazieri* Smith is known to be the host of the Liver-fluke in New South Wales, but it is not known regarding *I. newcombi*. The Liver-fluke is referred to at some length under family *Limnaeidae*. *I. newcombi* burrows in mud on the drying up of the water of the pool, and forms a hemispheric operculum of fine silt to close the mouth; the fine nature of this material is considered due to the mud having first passed through the snail's body. *I. subinflata* Sowerby was probably figured from an elongate individual of *I. newcombi*.

I. inflata Adams & Angas 1863 (*Physa*) Pl. 2, fig. 5. "The Inflated Isodorella." Sinistral, ovate-globose, thin; olive-green; spiral striations very fine; spire one-seventeenth length of whole shell; outer lip expanded; no columellar fold. Height 13.5 diam. 12.5 mm. Wakefield River, Torrens Reedbeds. (Type locality—Wakefield River). Closely resembles *I. newcombi* except that the spire is shorter, the whorls more swollen, and the colour olive-green.

I. rubida Tate 1881 (*Aplexa*). Pl. 2, fig. 7. "The Ruddy Isodorella." Sinistral, ovate-globose, solid; dark reddish-brown, mouth violet within; margin of the outer lip and columella white tinted; spire one-seventh length of shell; outer lip expanded; no columellar fold. Height 13 diam. 10.5 m.m. Yabmana (creek) Franklin Harbour, Kangaroo Island. (Type locality—Yabmana, S.Aust.). Resembles *I. newcombi* in shape but is easily distinguished by the solidity and dark reddish-brown colour of the shell, also by the carmine colour of the animal.

Ameria H. Adams 1861 (= *Glyptophysa* Crosse). Ovate sinistral; whorls flattened, angulated or carinated at the posterior part; spire short, depressed. Type—*Physa carinata* H. Adams. Of the species described here *A. aliciae*, Reeve, has the typical angulation and carination of *Ameria*, though the spiral carinations are obsolete in some specimens. Other species mentioned have not the carination, but otherwise closely allied to the type of *Ameria* and for the present included in that genus. The spire is very variable in length.

A. tenuistriata Sowerby 1873 (*Physa*) (= *Physa texturata* Sowerby). Pl. 2, fig. 6. "The Thinly Striated Ameria." Sinistral, subfusiform, fairly solid, fine reticulate sculpture; dark olive; axial striae distinct; spiral striae indistinct; spire barely a quarter of entire height; outer lip slightly expanded; columellar fold thin. Height 15.6 diam 9 mm. Reedy Creek, Mt. McIntyre Flat; River Onkaparinga, at Grunthal and Noarlunga; Peake, Strathdownie; Reedbeds River Torrens. Not uncommon (Type

locality—River Torrens). *P. texturata* Sowerby (Type locality—South Australia) was described as having the extreme upper margin of the whorl bordered with a fine white thread-like line, with a narrow dark band beneath it. *A. tenuistriata* is distinguished by the fine textured sculpture only visible under lens.

A. pyramidata Sowerby 1873 (*Physa*). Pl. 2, fig. 8. "The Pyramidal Ameria." Sinistral, pyramidal, solid, without reticulate sculpture; light brown; smooth; spire produced, from a quarter to a third of the length of the shell; whorls seven; rather convex; mouth auriform; outer lip slightly expanded; columellar fold present. Height 25.3, diam. 11 mm. Robe; Lake George, Beachport; Lake Wangary; River Torrens; Happy Valley Reservoir. Common. Very variable in length of spire. (Type locality—Flinder's Island, Bass Straits).

A. bullata Sowerby 1874 (*Physa*). Pl. 2, fig. 9. "The Inflated Ameria." Sinistral, ovate, inflated, rather thin, without reticulate sculpture, brown, smooth; spire from a fifth to a sixth of the length of the shell; whorls five-and-a-half, whereof the three or four upper ones are very small; mouth auriform; outer lip somewhat expanded; columellar fold thin. Height 18 diam. 10 mm. Overland Corner, River Murray; Lake Alexandrina; River Onkaparinga; Point McLeay; pond, Encounter Bay. (Type locality—South Australia.)

A. pectorosa Conrad 1850 (*Physa*). Pl. 2, fig. 10. Sinistral, ovate, tumid, solid; pale olive; smooth, except for growth striae; penultimate and body whorls inflated, apical whorls small; spire very variable in length; mouth banded with chestnut brown; columellar fold duplicate, posterior fold distinct, anterior indistinct. Height 24.6, diam. 13.7 mm. Ballone River; River Murray at Tailem Bend and Mannum; Lake Alexandrina; Binnam. (Type locality—Bogan River.)

A. aliciae Reeve 1862 (*Physa*). Pl. 2, fig. 11. Sinistral subovate, thin; white, periostracum yellow; whorls angulate spirally weakly carinate, carinations sometimes obsolete; spire from one-fifth to one-sixth of the length of shell; outer lip slightly expanded; no distinct columellar fold. Height 15, diam. 8.3 mm. Tailem Bend, River Murray; Lake Alexandrina; Gawler River; River Onkaparinga. (Type locality—Murray and Gawler Rivers, South Australia.)

PLANORBIDAE.

"Flat-coil Pond Snails." Discoidal, sinistral, usually consisting of many slowly increasing cylindrical whorls. Distribution—World-wide. Fossil—Lias. Animal having the inferior pallial lobe very prominent and transformed into a branchia; tentacles very long and slender; foot short and round, attached to the upper part of the body by a stalk. The animal seems too small for the shell, and when crawling, leaves part of the shell empty, putting one in mind of loose and ill-fitting clothes. Some species emit a purple-coloured fluid when irritated. Some of the smaller species inhabiting marshes which are dried up in summer, close the mouth of the shell with an epiphragm, or filmy covering, like land-snails, and await the rains. Herbivorous, frequenting stagnant or slowly-running water with an abundance of plants in it. They have been found at altitudes of 12,000 feet. Sexes united in the same individual. Eggs enclosed in a globular bag, fixed to stones and submerged water-plants; not many days are required for the eggs to hatch. In the latter part of the eighteenth century there was considerable discussion as to whether the shells were right or left-handed; it was settled by O. F. Muller 1774.

Planorbis Mueller 1774. *Planorbis* means flat-coil. Sinistral; more or less discoidal; spire flat, depressed on one or both sides; whorls slowly increasing, all of them visible from both sides; mouth small; peristome sharp, continuous. Type—*Helix cornea* Linne (England, Ireland, Europe, Siberia). Animal elongated, slender; mantle with a thickened margin; foot short, truncated in front, rounded behind; tentacles long, filiform.

P. isingi sp. nov. (not *P. obtusus* Deshayes from North Australia; not *P. fragilis* Brazier from Queensland). Pl. 3, fig. 9, 10. "Ising's Planorbis." Planorbid, depressed, thin; yellow, mouth whitish; axial growth lines, regular; whorls four, obtusely keeled; columella convex, following the curvature of the penultimate whorl; umbilicus wide, very shallow. Type—Height 2, diam. major 7.3, minor 6 mm. Point McLeay, Lake Alexandrina. (Reg. No. D10603, S. Aust. Mus.) Distribution—Reed-beds, River Torrens; Murray Bridge, River Murray; Meningie, Lake Albert; Riverton; Valley Lake, Mount Gambier. Rather variable. Most nearly related to the Tasmanian *P. atkinsoni* Johnston, but flatter, smaller, whorls less acutely angled, mouth wider but not so high. Named after Mr. E. H. Ising, chairman of the Field Naturalist Section of the Royal Society of South Australia (Inc.) and previously secretary for several years.

Segmentina Fleming 1830. Flattened; whorls usually laterally compressed, with angulated periphery, the last whorl embracing, internally contracted by periodic lamellae, usually three in number, and occurring three times in each volution. Type—*Planorbis lacustris* Forbes & Hanley, = *P. lineatus* Walker. (Europe). In the type, the internal plates, which are observable outside the last whorl of the shell, form half-closed chambers, and the animal retreats into the front one for safety; these plates appear to answer the same purpose as the teeth or folds which barricade the apertures of many of the small land-snails. The peculiarity of this structure induced one of its earliest discoverers, Lightfoot, to call the shell a *Nautilus*.

S. victoriae Smith 1881. "The Victorian *Segmentina*." Planorbid, dextral, glossy, chestnut; rather acutely keeled a little below the middle of the last whorl, obliquely convex above the keel, and not much flattened at the base; spire small, sunken in the middle; whorls four, convex, separated by a deep suture, last whorl larger; mouth horizontal, much encroached upon by the whorl, flat at the base, rather acute on the right; umbilicus deepish, occupying one-third the diameter of the base. Height 1.3, diam. 4 mm. (Type locality—Victoria). Also South Australia. In colour and general aspect closely resembles *S. australiensis* Smith (Penrith, N.S.W.) but is less flattened beneath; last whorl proportionately larger, and the sunken spire smaller; umbilicus narrower; no internal lamellae. Smith, when describing *S. victoriae* referred to the apparent inconsistency of placing a shell in the genus *Segmentina* lacking the essential character of internal lamellae, but its tout-ensemble being so Segmentinoid it is probably an abnormal form of that group.

ANCYLIDAE.

"Fresh-water Limpets." Non-spiral, conical, limpet-like. Distribution—Australia, Tasmania, New Zealand, Europe, North and South America. Fossil—Eocene. Animal not spirally coiled; tentacles short and compressed; inferior pallial lobe transformed into a branchia. Air breathers, inhabit both rapid and still waters, attached to stones and plants; some species appear to be amphibious, being found on rocks at the side of water-falls, having no other moisture than the spray which occasionally falls; when crawling only the tips of the tentacles and possible the front edge of the mantle are usually visible. Food consists of freshwater *Algae* or *Confervae*, as well as decayed vegetable matter. They have often been observed upon the wing-cases of flying water-beetles, and this is one means of distribution explained. One was also detected adhering to the leg of a

frog thirty yards from the nearest water. Tasmania possesses the largest known fresh-water limpet, *Ancylastrum irvinae* Petterd, measuring half an inch, whose peculiar features in addition to size, are the excessive deviation of the apex, the peculiar spiral protoconch, radiate sculpture and the subangulately rounded aperture.

Ancylus Geoffroy 1767 (*Ancylus* = a small round shield). "River Limpet." Conical, limpet-shaped, dextral or sinistral, thin; protoconch posterior, turned to one side; aperture with quite simple margins; interior with a subspiral muscle scar. Type—*A. fluviatilis* Muller (Europe), a dextral shell, each individual laying about 80 eggs in a season, which are enclosed in from seven to ten capsules, arriving at maturity in from twenty-four to twenty-seven days.

A. australicus Tate 1880. Pl. 3, fig. 11. "The Southern *Ancylus*." Limpet-shaped, lengthened, thin, delicate; pale-horn. Older parts having a reddish to blackish-brown periostracum; strong concentric folds anteriorly; protoconch blunt, at about two-fifths from the posterior end, inclining backwards, and directed to the right; slightly concave behind the protoconch; peritreme, oval, narrowed posteriorly. Height 1.5, length 4, breadth 2.5 mm. (Type locality—North Australia) Lyndoch Valley; Reedbeds, River Torrens on under-side of floating leaves of *Triglochin procera*, on the under side of stones and on the submerged leaves of aquatic plants, abundant; Brownhill Creek; Waterful Gully; Cooper Creek at Innamincka. Animal having the foot translucent, white, obtusely rounded behind; tentacles translucent, white, triangular, and sub-compressed at the base, cylindrical in the upper part, with a blunt tip; eyes black, placed in front of and slightly interior to the bases of the tentacles; muzzle emarginate when extended; only the tips of tentacles visible from beneath the shell when the animal is gliding.

Gundlachia Pfeiffer 1849. "River Limpet." Limpet-shaped, thin, non-spiral, obliquely conical; protoconch inclined backwards, basal side two-thirds closed with a flat horizontal lamina; aperture anterior, horizontal, semicircular. Young shells without a septum. Type—*G. ancyliformis* Pfeiffer.

G. petterdi Johnston 1878 (= *A. woodsi* Johnston 1888: = *G. beddomei* Petterd 1887). Pl. 3, fig. 12. "Petterd's *Gundlachia*." Minute, thin, diaphanous, spirally oblong in two distinct tiers; pale horn coloured; concentric striae crossed by radiate lirae; protoconch oblique, inclined posteriorly; apical tier more encrusted with confervoid matter, and appearing partially and obliquely exerted upon the basal tier; the projecting portion of apical tier as well as one-third of the basal tier closed by a

flat horizontal plate all in the plane of original aperture of apical tier; outer aperture broadly ovate; lip of basal tier continuous, although modified at junction with apical tier; inner aperture semi-circular; inner lip with slightly raised rim continuous, simple. In young the shell is simple and resembles an *Ancylus*. Length 6.5, breadth 3mm. Mt. Lofty (late MS.). (Type locality—On leaves in a pool, First Basin, Launceston, Tas.) Animal pale yellowish, with broad roundish muzzle, two short tapering tentacles; eyes sessile behind the tentaculæ; mouth with dark serrated horny jaws.

PUPILLIDAE.

“Chrysalis-snails.” Cylindrical, pupaeform, minute, umbilicated or rimate, multispiral; protoconch obtuse, sometimes reticulately pitted; mouth with 0.5 small teeth obstructing the aperture; no basal lamella; peristome usually reflected or expanded; outer lip with a tuberculiform callus above. Distribution—World-wide. Fossil—Carboniferous. Animal with a foot half as long as the shell, skin nearly smooth, inferior tentacles short but distinct. Small and gregarious; live in moss and rock crevices, on exposed hill sides under stones or at the roots of grass; vegetable feeders, living on small plants, and decaying leaves. Sexes united in the one individual. Some species ovoviviparous. The curious processes, called “teeth,” when present, fence in and contract the mouth of the shell, and may possibly serve a practical purpose in keeping out insect enemies which frequent the same situations.

Pupilla Leach 1831 (= *Pupa* of most authors). Horny, dextral or sinistral, cylindrical, with rounded, obtuse ends; striae faint or weak; protoconch minute, obtuse, pitted-reticulate; adult whorls 5-9, convex, short, slowly increasing; sutures slightly oblique; mouth rounded, with or without teeth, sometimes with an angular tubercle; peristome narrowly reflected; umbilicus a mere slit. Type—*Pupa muscorum* Linne (North America). Animal with the foot about half as long as the shell, skin nearly smooth; inferior tentacles short but distinct. Some species at least are ovoviviparous. Ground snails, living under wood and stones and among leaves in moderately humid situations. Albino shells are not uncommon.

Pupilla australis Adams & Angas 1863 (*Vertigo*) (= *Pupa lincolnensis* Cox: = *Pupa nelsoni* Cox: = *Pupa tasmanica* Johnston). Pl. 3, fig. 14.

“The Southern Pupilla.” Sinistral, cylindrical; pale-brown; striae oblique, strong; protoconch obtuse, irregularly, densely, shallowly pitted; whorls seven, convex; mouth semi-ovate; peristome thickened, broadly dilated, with a single parietal and a single columellar fold and a small columellar tubercle; um-

bilicus a chink. Height 4, diam. 1.8 mm. Rapid Bay, Marino, Halletts Cove, Edithburgh, Port Lincoln; under stones. Not common. Along the coast from Sydney and South Australia to the islands off Western Australia. (Type locality—Rapid Bay, S.A., in crevices of rocks.) Type locality, *P. lincolniensis* Cox—Port Lincoln; *P. tasmanica* Johnston—Swansea (Tasmania) sand dunes; *P. nelsoni* Cox, Nelson Bay, New South Wales. Very variable.

Pupoides Pfeiffer 1854. Small (about 3-6 mm), long-ovate, dextral or sinistral, turreted or rarely cylindrical; protoconch obtuse; whorls (generally 5-6), rather long; mouth ovate, toothless except for a small, tuberculiform, angular lamella close to the insertion of the outer lip, or united with it, but rarely wanting; peristome expanded, reflected and usually thickened within; umbilicus a mere slit. Type—*Bulimus nitidulus* Pfeiffer. Distribution all continents except Europe. *Pupoides* is mainly a tropical and subtropical genus, but occurs also in arid, or relatively dry stations in humid areas. Found under stones or at the roots of grass, and sometimes after rains on trees a few feet from the ground. The living shells are often coated with dirt adhering by the slime of the animal. *Pupoides* differs from *Pupilla* by the tapering spire, the longer, more loosely coiled whorls, longer mouth and the obliquity of the parietal margin of the latter; there is never a crest or furrow behind the lip.

P. adalaidae Adams & Angas 1863 (*Buliminus*) (= *Pupa ramsayi* Cox 1864). Pl. 3, fig. 15. "The Adelaide *Pupoides*." Solid, dextral, pupiform, turreted, dilated in the middle, rather opaque, cream-buff with whitish streaks, browner towards the protoconch, whiter on the last few whorls; striae distinct, irregular; whorls six, convex; the penultimate whorl as wide as the last, and above that it tapers rapidly to the small somewhat obtuse, glossy protoconch; mouth roundly-ovate, peristome interrupted, white, narrowly reflected, internally thickened, outer lip with a small white, angular tubercle above. Height 6.4., diam. 3 mm. Flinders Range, Rapid Bay, Wallaroo, Point Lowly, Port Lincoln in rocky places. Larger and more cretaceous than other Australian species, and has the appearance of a desert snail. (Type locality—"South Australia, rocky places." Angas).

P. myoporinae Tate 1880 (*Bulimus*) new name for *Bulimus sinistrorsus* Tate 1879, not of Deshayes). "The *Pupoides* found living under the shelter of *Myoporum parvifolium*." Sinistral, umbilicated, oblong-turreted, very thin, translucent; yellowish-horn; spiral striae, regular, very fine; spire elongated, gradually tapering, rather acute; whorls five, moderately convex, last whorl equalling one-third length of shell; mouth somewhat ovate peristome white, expanded, especially the columellar margin; outer lip with a white tooth-like callosity in the angle. Height

4.5, diam. 1.5 mm. (Type locality—Under small bushes on the sandy margin of the salt swamp at Peelunibie, head of the Great Australian Bight, 50 examples observed.

P. ischnus Tate 1894 (*Pupa*). Sinistral, pyramidally oval, thin, translucent, shining; yellowish-brown; striae, fine, oblique; protoconch obtuse; whorls five-and-a-half, moderately convex; suture impressed; mouth oval, truncated above, peristome white, broadly reflected, especially over the columella, which does not conceal a narrow umbilical fissure; lips callously united and there is a prominent tubercle at the insertion of the outer lip. Height 4.25, diam. 1.25. (Type locality—Alice Springs and Palm Creek). Agrees with *P. myoporinae* in its sinistral spire and apertural characters, but differs in its narrow elongate shape and flatter whorls.

SUCCINEIDAE.

“Amber-snails.” Dextral, oblique, paucispiral, very thin, transparent, body-whorl large, mouth large, no operculum. Distribution—World-wide, in damp places, near the margins of lakes, ponds, and ditches, or in dry situations where no water ever lodged. Fossil—Eocene. Animal of a gelatinous consistency, with foot large and oblong; tentacles four, the lower pair very short (in some species absent); jaw with a median quadrangular accessory piece, projecting upwards. The amber-snails are usually a little too big for their shells, and are vegetarians. Shells without columellar fold.

Succinea Draparnaud 1801. *Succinea* signifies amber-colour. Oval, very fragile, transparent; spire short; whorls few, very rapidly enlarging; mouth oval outer lip thin, not reflected, united below by a broad curve with the thin, smooth columella. Type—*Succinea putris* Linne (England) which shell is sometimes found with the tentacles abnormally distended by the presence of a fluke (*Distoma macrostomum*) which is destructive to birds partial to amber-snails, like the blackbird, thrush and wagtail. The completion of the life cycle of the parasite must take place in the body of a vertebrate, so when the Amber-snail is eaten by the bird, the *Distoma* is in a position to fulfil its destiny. (See also under *Limnaeidae*).

S. australis Ferussac 1821 (= *S. legrandi* Cox: = *S. strigata* Pfeiffer). Pl. 3, fig. 16. “The Southern Amber-snail.” Ovately conical, thin, transparent; pale-horn colour, sometimes with darker streaks; striae rugose; whorls three, convex, last forming two-thirds of the length; mouth acutely oval, incumbent; peristome simple, straight; columella subcallous, somewhat slightly receding. Height 12, diam. 7 mm. Rather common. (Type locality—Kangaroo Island and the Isles of St. Peter and St. Francis, S.A.)

HELICIDAE.

"Snails." Spiral, usually depressed, moderately thick; mouth edentulous or contracted by teeth; lip usually reflected; no operculum. Distribution—Universal. Fossil—Cretaceous. Animal having a short, well-developed retractile head, with four cylindrical retractile tentacles, the upper pair longest, and bearing eye-specks at their summits, the lower occasionally wanting; mouth with an arched and ribbed jaw; body spiral, distinct from the foot; respiratory orifice near the base of the right ocular tentacle, small and valve-like; mouth armed with a horny, dentated, crescent-shaped upper mandible. Snails have their periodical seasons of repose, apparently when there is a deficiency of food, or during climatic extremes; in cold climates, they hibernate, burying themselves in the ground, or nestling in rock crevices, under the bark of trees or in the hollow of umbelliferous plants; at this time they exude a quantity of slime, which, when hardened by exposure, forms a slight membrane, called the epiphragm, entirely closing the mouth of the shell; at a little distance within, a second membrane is stretched, then a third and sometimes a fourth, always thinner than the first one. In our warmer climate snails do not hibernate, but aestivate, or summer-sleep, and await the rains when they emerge to find succulent food; the epiphragm during aestivation is thinner than in hibernation, but serves to keep the dry air out and the moisture inside. The shell is sufficiently roomy to accommodate the entire animal and varies considerably in size and shape; it may be disk-shaped, nearly spherical, or conical according to the species. The sexes are united in the same individual. In many species of this family, including the imported, common garden-snail (*H. aspersa*) there is the development of what has been termed the "love dart." The instrument consists of a delicate shaft of carbonate of lime, finely pointed, and contained in a pocket of the female organ, whence it is discharged just prior to the union of two individuals, and embedded in the flesh of its mate. It is only found in mature snails, and its use apparently is to excite the sexual instinct. "Love darts" have been found piercing leaves, showing that the aim is not always true. The eggs are roundish, enclosed in tough "shells" which are laid in little heaps, often in burrows excavated by the foot of the snail. Three typical genera of South Australian *Helicidae* are dealt with here. They are sometimes all grouped under *Thersites* Pfeiffer, but this becomes thereby somewhat unwieldy, and further many of our species have a facies not matched elsewhere. We prefer to follow Pilsbury (Tyron), except as regards a section of desert snails peculiar to South Australia and Western Australia for which we propose a new genus.

Badistes Gould 1862. Globose, rather thin, sometimes with a peripheral keel; surface densely microscopically granulated all over; spire elevated, somewhat dome-shaped; peristome a little thickened and very narrowly expanded, suddenly dilated at the columellar insertion, closing or almost closing the narrow umbilicus. Type—*Helix gulosa* Gould 1846 (Illawarra, N.S.W.) Animal with a slight groove on each side, running from the lips upward and backward to the mantle; back with a median furrow banded by two rugae or sets of rugae, on each side of which there are about six ranks of long narrow tubercles; rest of body partially covered with irregular polygonal tubercles which are usually subdivided into minor tubercles; jaw arched, crossed asymmetrically by nine stout, flat-topped unequal ribs, denticulating both margins. Distribution—Mainly New South Wales and Victoria, but also South Australia. The species are highly polymorphic, and have evidently been moulded by external conditions into a great number of local forms. The distinguishing features from the next genus, *Notobadistes* gen. nov. are in brief: Carinated or subcarinated at the periphery, unicoloured or with a dark band at suture and umbilicus. The representative genus of tropical Australia is *Sphaerospira* Morch 1867, which is larger and more solid, yellowish, with brown spiral lines and bands of uniform chocolate brown; surface smooth, peristome broadly expanded.

B. bednalli Brazier 1871 (*Helix*). "Bednall's Badistes." Umbilicated, rather conoidly globose, dextral, very thin, fragile, obliquely rugose at the upper part, granulated under the lens, subdiaphanous; light horny green, with a fine reddish ring encircling the suture, another broad one encircling the umbilicus; spire conoid, somewhat obtuse; whorls about five, moderately convex, the last very much inflated, rounded; base convex, smoother than the upper surface; mouth obliquely lunar, large; peristome thin, pinkish; outer lip expanded; columellar margin reflected and partly covering the umbilicus. Height 10, diam. 16 mm. (Type locality—Near Adelaide).

B. patruelis Adams & Angas 1863 (*Helix*). "The Cousinly Badistes." Umbilicated, orbicularly-depressed, dextral, rather coarsely rugosely ribbed, especially at the suture, rather thin, moderately shining; reddish-chestnut with a pale spiral band under the suture; spire widely and obtusely conical; whorls five, convex, last whorl sometimes indistinctly angulated, not descending in front; base smoother and more glossy than above, with a wide yellowish patch surrounding the dark circumference of the umbilicus, which is moderate and deep; mouth diagonal, lunately-ovate; peristome simple, thin, straight, the dark colu-

mellar margin dilated above and reflexed, to cover half of the umbilicus. Height 12.5, diam 25 mm. (Type locality—Port Lincoln, under dead logs.) Flinders Island. Very variable, ground colour ranges from pale-reddish-horny to very dark reddish-chestnut.

B. evandaleana Pfeiffer 1863 (*Helix*). "The Evandale Badistes." Umbilicated, depressed, dextral, rather thin, rugosely striated, and under the lens granulated and furnished with short hairs; dirty-yellowish and blackish brown; spire slightly elevated, obtuse, suture rather deep, whorls four, convex, last whorl more or less obtusely carinated; base convex, the striae and granulations gradually becoming fainter; umbilicus moderate, deep; mouth lunately-ovate; peristome simple, thin; more or less angular externally, at the columella triangularly dilated above. Height 7.5, diam. 13.7 mm. (Type locality—Evandale, S.A.) North Rhine and Barrier Ranges. The rugose striation, granulation, and pilosity (the last often obsolete) are characteristic.

B. tomsetti Tate 1887 (*Helix*). "Tomsett's Badistes." Conoidly depressed, dextral, rather thin, widely and deeply umbilicated; colour of living shell unknown; striae coarse, irregular, oblique; distantly granulated; spire slightly elevated, widely conical, obtuse; whorls five, flatly convex, narrowly concavely depressed near the anterior suture, and margined at the suture; last whorl rounded, rather depressed above, and bluntly angled at the periphery; posterior to angulation at the periphery the surface is slightly depressed, thence convex to the suture; base rather abruptly convex; mouth not descending in front, oblique to the vertical axis, rotundately lunate; peristome simple, thin, disunited; columella very slightly reflected over the umbilicus. Height 7, diam. 14.5 mm. (Type locality—Cape Borda). Flatter and with a larger umbilicus than *B. evandaleana*.

B. lincolnensis Pfeiffer 1863 (*Helix*). "The Port Lincoln Badistes." Umbilicated, somewhat conoidly depressed, dextral, rather thin, moderately glossy, pellucid; uniform rich deep-chestnut, suture pale; striae close, coarse, irregularly rugose; finely granulated; spire slightly elevated, widely conical, obtuse; whorls five, rather flattened, last rounded, rather depressed above, and sometimes indistinctly angular at the periphery, descending in front; base less strongly striated than above, smoother and more glossy, umbilicus small; mouth lunately ovate; peristome simple, thin, straight, margins moderately approximating, columellar margin rather widely expanded above, and reflected over half of the umbilicus. Height 8.75, diam. 20 mm. (Type locality—Port Lincoln).

B. luteofuscus Cox 1868 (*Helix*). "The Dark Yellow Badistes." Openly umbilicated, depressed, dextral, thin; yellowish-brown or dark chestnut; striae oblique, rugose; obsolete granulated; spire rather prominent; whorls four-and-a-half, regularly increasing, last whorl depressed throughout, on which the elevation of the spire depends, periphery blunt, slightly angled, base convex; mouth diagonal lunately rounded; peristome simple, lip thin, margins approaching, columellar margin but little everted, the opposite margin inserted beneath the angulation of the second whorl. Height 8, diam. 16 mm. (Type locality—Flinders Range).

Notobadistes gen. nov. "The Southern Badistes." Globose, rounded (not carinated) at the periphery; body-whorl with two or three colour bands above, with or without an umbilical dark patch; rather rudely, strongly, axially striate; last whorl globose, deeply descending in front; columella expanded, reflexed, nearly covering the narrow umbilicus. Type—*Helix bitaeniata* Cox 1868 (Port Augusta). The genus is characteristic of the *Helicidae* fauna of South Australia, and is confined to the southern areas of the Continent. This may be regarded as a subgenus but, to avoid a trinomial, we prefer to treat it as a full genus.

N. bitaeniatus Cox 1868 (*Helix*) (= *Helix flindersi* Adams & Angas 1863). Pl. 3, fig. 19. "The Two-banded Notobadistes." Globose, rather thin, dextral, narrowly umbilicated; straw-coloured, or tinged with green or brown, with two purple-brown bands, one at the suture, the other and wider one above the periphery; surface rather strongly striated, especially above; spire obtusely conoidal; whorls five, convex, the apical whorl shining, smooth; last whorl globose, rather deeply descending in front; mouth rounded-lunar, oblique, white within, showing the brown band; peristome blunt, not expanded, white; columella expanded, reflexed nearly over the narrow umbilicus. Height 13, diam. 20 mm. (Type locality—Port Augusta): Tillowie, near the western slopes of Flinder's Range. The most globose of this genus of two-or-three banded forms, and distinguished by its narrow, half-covered, but deep umbilicus, and strong striation.

N. loriolianus Crosse 1863 (*Helix*). Globose-depressed conoidal, dextral, almost or quite imperforate, rather thin but strong; yellowish, with two brown bands, one at suture the other above the periphery, and a small brown umbilical patch; surface not granulate, lightly obliquely striate; spire bluntly conoidal; whorls five, scarcely convex, separated by superficial sutures; last whorl descending in front; mouth oblique, white and bifasciate within; peristome gradually but only slightly ex-

panded, columellar triangularly reflexed over the umbilicus, rose-tinted; terminations of peristome approaching slightly. Height 18, diam. 23.5 mm. (Type locality—South Australia). Less globose than *N. bitaeniata*, and not nearly so deeply cut by the oblique striae.

N. broughami Angas 1875 (*Helix*). "Brougham's Notobadistes." Narrowly umbilicated, conically globose, dextral, rather thin; very pale brown above, white below, with three narrow reddish-brown bands, one at the suture, one above and one below the periphery of the last whorl; obliquely striated and obscurely minutely granulated; spire obtusely and depressedly conical; whorls five-and-a-half, slightly convex, the last rounded, descending in front; mouth oblique, circularly lunate; peristome slightly expanded and reflexed, the margins approximating, columellar margin almost straight, dilated above, and nearly covering the umbilicus. Height 21, diam 25 mm. (Type locality—Port Lincoln). Allied to *N. cassandra*, but more elevated, the columellar straightened, dilated and reflexed, nearly covering the umbilicus.

N. rufofasciatus Brazier 1875 (*Helix* [*Hadra*]). "The 'Rufus-banded Notobadistes.'" Moderately umbilicated, globosely depressed, dextral thin; pale brown, with dark chestnut spiral bands; minutely rugosely granulated, whorls five, slightly convex, regularly increasing, the last large and inflated in front, roundly convex, below the periphery the chestnut band becomes broader and runs spirally into the mouth; base white with chestnut brown around the umbilicus; mouth roundly lunate, slightly angular, peristome thin, acute, margins rather distant, the columellar margin dilated partly over the umbilicus, interior of mouth white or pink, the brown bands are seen through the shell. Height 14, diam. 26 mm. (Type locality—Yardea, 360 miles north of Adelaide). Approaches *N. cassandra* Pfeiffer, but differs in having dark chestnut bands above and below with a large broad white band on the base, and chestnut brown round the umbilicus.

N. subliriolianus Pilsbury 1890 (*Helix*). Depressed narrowly umbilicated, dextral, rather thin; light yellowish with a chestnut band at the suture, another just above the periphery, interior of umbilicus also chestnut coloured; surface striatulate, not granulate; spire more conoidal than *N. cassandra*; whorls five, moderately convex, the last rounded at the periphery; mouth oblique, rounded lunar, flesh-coloured within, showing the bands; peristome simple, white, the columellar triangular dilation flesh-coloured, partially covering the umbilicus. Height 14, diam. 23.5 mm. (Type locality—Flinder's Range.)

N. cassandra Pfeiffer 1863 (*Helix*). (The gift of prophecy was conferred by Apollo on Cassandra, with the reservation that no one should believe her.) Depressed, moderately umbilicated, thin; nearly white beneath, pale brownish-yellow above, with a pale brown band at suture and another above the periphery; surface delicately striatulate and densely microscopically granulate all over, save the polished protoconch; spire low, broadly convex; whorls five, convex; suture at first impressed, then becoming shallower; last whorl depressed, rounded at periphery, slightly descending in front; mouth round-lunar, white within; peristome simple, columella suddenly expanded, half covering the umbilicus. Height 13, diam. 23 mm. (Type locality—Lower Murray River, S.A., in bushy patches amongst sandstone cliffs. The low spire, delicate whitish colour, with pale bands, and densely granulate surface distinguish this form.

N. fodinalis Tate 1892 (*Helix*). Pl. 3, fig. 17. Globosely conic, moderately umbilicated, dextral, rather thin, somewhat glossy; pale-brown above, paler beneath, sometimes with a narrow reddish-brown infuscation in front of the suture; surface coarsely and closely wrinkled axially, somewhat closely and finely incised—striate spirally; whorls four and a half, regularly convex; first almost smooth but minutely granulated and obsoletely wrinkled; granulations later disappear, and wrinkles increase; last whorl somewhat inflated, slightly descending in front; suture linear; base convex; umbilicus moderately wide with precipitous sides, and towards the inner lip subangulated; mouth oblique, subcircular; peristome subacute, slightly reflected; columella-margin dilated above and slightly extending over the umbilicus. Height 15, diam. 18 mm. (Type locality—Wankaringa, S.A., beneath blocks of stones on the outcrop of the auriferous reef: alive in considerable numbers.) Between Victoria Spring and Fraser Range, one dead specimen. Differs from *N. nullaborica* in the absence of an impressed suture, finer and closer spiral striae, larger umbilicus as well as by colour and thinness of shell. Animal with foot of a chestnut colour with grey rugosities, broad and short behind; eye-pedicels blackish; tentacles chestnut; colar milk-white.

N. nullaborica Tate 1878 (*Helix*). (The specific name is from that of the treeless portion of the Bunda Plateau known as the Nullabor Plain.) Globosely conic, narrowly umbilicated, very thick, dextral; whitish; axially coarsely and closely wrinkled, interrupted by equidistant incised lines; whorls four and a half, retund, slightly flattened at the suture, which is impressed; last whorl somewhat inflated, descending but little in front, base

convex; mouth oblique, subcircular, peristome subacute, slightly reflected, margins joined by a callus; columella-margin thickly dilated above and nearly covering the umbilicus. Height 18, diam. 18 mm. (Type locality—Bunda Plateau, extending to the scrubby sand hills on its east, and to the Roe Plains at foot of the Hampton Range, in Western Australia). Somewhat resembles *N. angasiana*, but *nullaborica* differs in its more globose form, minute, umbilicus wrinkled surface, and axially impressed lines, and in the callus covering the columella.

N. angasiana Pfeiffer 1862 (*Helix*). "Angas' *Notobadistes*." Depressed-globose, deeply umbilicated, solid; two chestnut bands, one subsutural, the other above the periphery; growth striae distinct, oblique, also peculiar numerous microscopic spiral scratches; spire conoidal; protoconch flattened; whorls five, convex, the last somewhat descending in front, rounded at periphery; sutures well impressed; mouth not much oblique, circular; lip well expanded all around, terminations approaching, connected by a parietal callus; umbilicus deep, rather cylindrical, its sides nearly perpendicular. Height 19, diam. 22 mm. (Type locality—Near Lake Torrens, S.A.).

Glyptorhagada Pilsbry 1890. Helicoid, keeled at the periphery, rudely sculptured with oblique fold-like axial wrinkles; outer lip hardly expanded; texture calcareous. Type—*Helix silveri* Angas 1868, from the Eastern Plains of S.A. This is a South Australian genus, closely related to the two last-mentioned genera. The rudely sculptured earthy-shell is the outcome of the arid conditions prevailing in the interior of South Australia; desert snails in general appear to have undergone a similar modification. The species were formerly grouped in *Rhagada* but their affinities are evidently with *Badistes*.

G. silveri Angas 1868 (*Helix*). Pl. 3, fig. 18. "Silver's *Glyptorhagada*." Globose-conic, umbilicated, thin, cretaceous, horn coloured, narrowly, obscurely three banded with brown, corrugated by strong, oblique, flexuous folds; spire conoid; protoconch obtuse; whorls six, a little convex, the last descending in front; periphery slightly keeled; base convex; suture distinct; mouth oblique, sub-oval, margins converging, joined by a thin callus; outer lip thin, acute, a little expanded; columellar margin expanded above, reflexed, half covering the umbilicus. Height 16 diam. 22 mm. (Type locality—The Eastern Plains, S.A.).

G. kooringsensis Angas 1877. "The Kooringa *Glyptorhagada*." Somewhat globosely lenticular, umbilicated, rather thin; cretaceous, white; strongly obliquely flexuously corrugated, corrugations more or less elevated and irregular, the interstices crossed with short, impressed, interrupted, spiral lines, especially

on the basal portion of the last whorl; spire flatly conoidal; protoconch obtuse; whorls five, slightly convex, the last very strongly flatly carinated, not descending in front; base tumid around the umbilicus; sutures impressed; mouth oblique, subquadrate; outer lip simple; columella arcuate, slightly thickened and partly expanded over the umbilicus. Height 12.5, diam. 25 mm. (Type locality—30 miles north-east of the Burra Mines, S.A.). Similar to *G. silveri*, but corrugations less angular, umbilicus larger, shell flattened, and the last whorl very prominently keeled.

G. bordaensis Angas 1880 (*Helix*). "The Cape Borda Glyptorhagada." Lenticular, widely and deeply umbilicated, moderately thin; cretaceous, white; very strongly and irregularly obliquely flexuously, corrugated, the corrugations becoming larger and more elevated toward the middle of the whorls; spire depressed; protoconch obtuse; whorls five, nearly flat, the last depressed and strongly keeled above the periphery, not descending in front, slightly keeled around the umbilicus; mouth oblique, semi-lunar; outer lip simple; columella very slightly expanded; margin united by a thin calus. Height 6.5, diam. 16 mm. (Type locality—Cape Borda, S.A.) Sculpture somewhat similar to *G. silveri* and *G. koorिंगensis*, but differs in having the raised corrugations more numerous and elevated, displaying at the sutures and on the keel an elegant frilled appearance; it is also smaller, flatter, has a wider perspective umbilicus, and the corrugated ridges show here and there a tendency to bifurcate.

G. howardi Angas (*Helix*). "Howard's Glyptorhagada." Moderately umbilicated, rather solid; yellowish-horny, with two indistinct chestnut bands; obliquely irregularly striate, and slightly, very minutely granular; whorls four and a half, slightly convex, last a little descending in front; base more convex, without bands; periphery acutely carinated; peristome white, chestnut at the junction with the body, slightly expanded. Height 10, diam. 22 mm. (Type locality—450 miles north of Adelaide).

RHYTIDIDAE.

Heliciform or auriform, generally umbilicated, with depressed or plane spire, and simple peristome. Distribution—Australia, Tasmania, New Zealand, New Guinea, New Caledonia, Polynesia, South Africa. Animal with the mantle not or but little reflected over the shell, without a caudal pore; no jaw; mostly oviparous, but some species are known to be ovoviviparous. Carnivorous. Differs from the true *Helices* by the absence of a jaw.

Rhytida Albers 1860. Convexly depressed, umbilicated, thin, but not devoid of calcareous matter; striated or rugose; spire not much raised; whorls four to five, slightly convex; umbilicus wide, funnel-shaped; peristome simple sharp. Type—*Helix greenwoodi* Gray 1850 (New Zealand). Animal having neck, tail, and sides of body irregularly granular, tail flattened and pointed, foot somewhat narrow; mantle with three lobes; buccal mass very large and muscular.

R. gawleri Brazier 1873 (*Helix*). Pl. 3, fig. 20. "Gawler's Rhytida." Convexly depressed, umbilicated, thin, shining; horny-brown, with dark-reddish oblique streaks here and there; very closely rugosely wrinkled with oblique striae to the periphery, interstices smooth; spire small; whorls four and a half, moderately convex, the last large, inflated in front, depressed above; base convex, yellowish, glossy, sculptured with striae giving it a wrinkled appearance; mouth oblique, ovately lunate, interior pinkish; peristome simple, thin, margins nearly approximating, the outer arch, columella thin and reflexed; umbilicus large and deep, rounded at the edge, with the striae more distinct and running into the interior. Height 12, diam. 16 mm. (Type locality—Mount Lofty Ranges).

ADDITIONS TO OUR LIBRARY.

1. "The Queensland Naturalist" for April. An illustrated article on the Giant Stinging Tree (*Laportea moroides*) of the Queensland scrub or rain forest will be found of great interest.
2. "The Victorian Naturalist," June and July numbers. Two color plates illustrate an article on the Coral fungi (*Glavaria*), of Victoria and South Australia. An article in the July number on native cats treats of a subject which be of interest to our members.
3. "The S.A. Ornithologist" for July.
4. "The Western Australian Naturalists' Club Magazine" for June.
5. Linnean Society of New South Wales. Abstract of proceedings for May.
6. "The Australian Museum Magazine" June number. This number contains several articles of greatest interest, of which "The Way of the Wasp," Part I., is one of the most instructive.
7. "The Australian Museum Magazine," September number. "The Way of the Wasp" is continued and other well-illustrated articles afford interesting information on Australian nature topics.
8. Papers and Proceedings of the Royal Society of Tasmania, 1931. Dr. R. S. Rogers contributes a paper on the Orchidology of Tasmania.
9. "The Australian Naturalist," July number.

NOTE.—Held over for future issue:

Owing to the pressure on our space, articles by members have had to be held over.

WILD FLOWER SHOW
TOWN HALL, OCTOBER 14 and 15

The Show arrangements are well advanced, but more workers are required on the Committee. The Officers and Committee would greatly appreciate offers of help from members generally.

FIELD NATURALISTS' SECTION OF THE
ROYAL SOCIETY

PUBLICATION NO. 2

GEOLOGICAL AND BOTANICAL NOTES

on the

VICTOR HARBOUR DISTRICT

by

PROF. WALTER HOWCHIN, F.G.S.

and PROF. J. B. CLELAND, M.D.

Published by Cole's Book Arcade, 14 Rundle Street. Price 1/.

